Laboratory Scrapbook, Cat. 1168

This scrapbook covers the period February 1874-January 1876. The laboratory notes and drawings glued into the book are primarily by Edison and Charles Batchelor and relate to telegraphy. There are also paper-strip recordings of musical tones and the human voice. The book also contains many clippings about the telegraph industry, including several large cartoons depicting the Western Union monopoly and the power of Jay Gould, as well as other clippings dealing with matters of technological, scientific, and economic concern. Business-related material includes forms, price lists, and a service map of the Domestic Telegraph Co.; a price list from George Wale & Co., philosophical instrument makers; and advertising circulars. The cover is marked "Vol P."

The book contains 62 numbered pages followed by many unnumbered leaves, all but one of which are blank. Several leaves have been removed from the middle of the volume.

Blank pages not filmed: 53-54, 61-62.

THE REDUCTION RATIO FOR THIS DOCUMENT IS 18:1

Coll. 116.8

CHEMISTRY

SCRAPS.

Index.

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Celluloid	1

CELLUOID—A NEW AND IMPORTANT INDUSTRIAL MATERIAL.

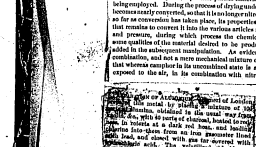
About eleven years since, Messrs. Phelan & Collender, of this city, offered a large premium for the invention of a substitute for ivory for billiard-balls. The offer having come in the notice of Mr. J. W. Hyatt, then a resident of Albany, N. Y., this gentleman set to work to discover a substance which should possess the required qualities. He manufactured various compounds, one of which was found to be sufficiently strong and elastic, but the surface was not sufficiently fine and the color was bad. This compound was a mixture of shellac and paper-pulp, combined by a new process, the same now used by the Hyatt Billiard-Ball Company, at Albany, for the manufacture of billiard-balls.

In searching for some solution to fill up the pores of this material and qualify it to receive a fine polish, Mr. Hyatt's attention was called to collodion. Alexander Parkes and some others had, at least eighteen years ago, made use of this material, but Mr. Hyatt was the first to use it for the time of his first experiments. These who employed soluble cotton, previous to Mr. Hyatt's experiments, made it into a paste by the addition of ether and alcohol. They then made a thin solution like that employed by photographers. This they gradually reduced it to the consistency of paste by evaporating more and more of the cotton; and, finally, they reduced it to the consistency of dough by evaporating off a portion of the solvents. But here difficulties presented themselves, for, if it be attempted to add more of the soluble cotton in a thick paste of collodion, the cotton will not dissolve nor soften. A large percentage of the fibres retain their original condition, and the result is a material not homogeneous and more or less fibrin. It is as though so much fibre were mixed with the pasty collodion. The reason of this is that the mixture of ether and alcohol only possesses the power of the soluble cotton before the solution has reached that point of saturation which much reduces its fluidity. It is also found that in reducing the collodion from a pasty condition to a solid, the bulk of the mixture is decreased three-fourths and sometimes even more, and when the consistency of dough is reached, which is as low as the material can be mixed and have the particles weld, from that point to the point of absolute dryness the decrease in the bulk is more than one-half. It follows that for every ten pat on the billiard balls, which are about a quarter of an inch thick at first, when they become solid and are turned down, are less than a sixteenth of an inch in thickness. Moreover, the quality of the cotton has to be very perfect, or the material will be extremely short when prepared by a liquid solvent. Obviously, the material thus prepared is, fit for very few uses, except as a coating for billiard-balls, or for some analogous purpose, as it has no elasticity, and there are no many difficulties in working it.

In 1869 and 1869, Mr. J. W. Hyatt, of Mr. J. W. Hyatt, of Albany, N. Y., invented a process, and there are no many difficulties in working it. In 1869 and 1869, Mr. J. W. Hyatt, of Albany, N. Y., invented a process, and there are no many difficulties in working it. self in the problem, and together these gentlemen remedied the idea of employing mechanical means in order to enable them to use the minimum amount of solvent to the any proportion of soluble cotton. They first succeeded in this attempt by putting the cotton into a close, strong cylinder, exhausting the atmospheric air, and forcing a mixture of alcohol and ether through the mass instantly, by great pressure, so that it would penetrate through all the particles of the cotton before the solvent had time to act upon it. The essential feature of this process is the rapidity with which the solvent is forced into the cylinder. If they are forced in slowly, a stratum upon the top is converted into a doughy mass, and through this the remaining liquid cannot be forced. While the soluble cotton remains still in a state of fibre, the mixed liquids must be injected suddenly and forcibly and held under pressure, and in two minutes fibre the cotton can be removed from the cylinder as solid as oak-wood. This process was patented in 1870.

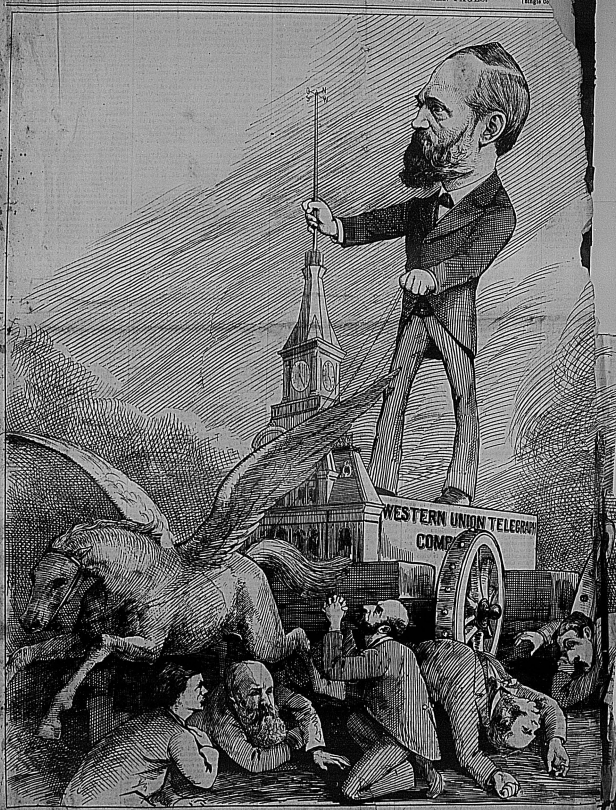
In the early part of 1870, the Messrs. Hyatt made numerous experiments, the purpose of which was to render more conducive the *gumminess* of the soluble cotton material, and also to secure desirable qualities which did not exist in the solid collodion obtained by the process patented in 1869—viz., plasticity when heated, and the reduction of inflammability. Among other substances experimented with, camphor was mixed with the cotton. It had been known previously that a solution of camphor in alcohol was a solvent of soluble cotton. It was reasoned, therefore, that camphor would combined with cotton at any stage of the process, and that upon the addition of alcohol the same result would be obtained as when alcohol is previously mixed with the camphor. In the first experiment of mixing the camphor with the wet pulp, with a casually-opening of it with the hand, it was found that it competed and showed signs of crystallization, although no alcohol had been added. This important discovery was the origin of the present manufacture of celluloid, for it was immediately found by experimenting the experiment that camphor alone was, under proper conditions, a perfect solvent of soluble cotton. In a very short time after the discovery, a lump of solid celluloid was produced by heating the material to a temperature less than that necessary to solid camphor. It was, moreover, found that a perfect chemical combination of the two substances resulted, and that a perfect chemical product of celluloid was the result produced.

The outline of the process now employed in the production of celluloid is as follows: After the pulp is ground in the beater-engine, and the camphor and whatever coloring matter may be desired are thoroughly incorporated with it, the material is being kept reasonable at the proper temperature, the superfluous water is removed by pressure and absorption, a peculiar porous material made specially for the latter purpose being employed. During the process of drying under pressure and absorption, the material becomes converted, so that it is no longer nitro-cellulose, but imperfect celluloid. In so far as conversion has taken place, its properties have undergone a total change. All that remains to convert it into the various articles referred to is manipulation under heat and pressure, during which process the material referred to is manipulation under heat and pressure, during which process the material is completed. Gen. Manufacturers, of this city, is the president of the Company. We are promised specimens of celluloid, and we shall be happy to show to any of our readers or clients who desire to investigate its character with a view to its introduction into any application. For some delicate parts of models, requiring great strength in proportion to size and weight, it would be excellent.



THE TRUE ZERO POINT OF THE CENTIGRADE THERMOMETER.—Dr. Crole, in a recent number of *The American Chemist*, calls attention to the fact that the true zero point of the Centigrade, or that of the Fahrenheit scale, is not that of the freezing point of water, but the melting point at ice, and that point in which even a considerable portion of ice is immersed in nearly several degrees above the freezing point. It, however, the thermometer be immersed in melting ice or snow, from which the water is draining off as it is produced, the mercury will attain the exact temperature desired.—Dr. Crole also remarks that any mixture of ice and water, at the current realm. If the temperature is below the freezing point, the ice will melt, and if above, it will freeze, the result being in either case the production of water at the freezing point. Ice is accumulation of water about the freezing point, and is the best medium for the purpose, whether it be used in the form of snow or broken ice, with salt sufficient to make the thermometer sink into the melting mixture, which in time takes place very rapidly, and consequently, there is no necessity to wait for any considerable length of time.

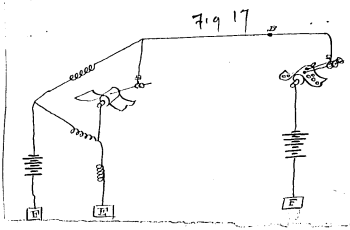
VOL. VI. All the News. Four Millions Daily. NEW YORK, SATURDAY, FEBRUARY 27, 1875.—TEN PAGES. $10 Per Single Co.

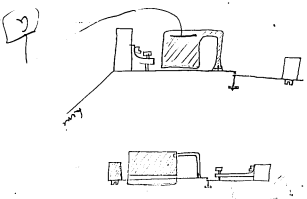


THE GREAT TELEGRAPH JUGGERNAUT.

HOW THE TELEGRAPH MONOPOLY TREATS ITS VICTIMS.

Fig 17





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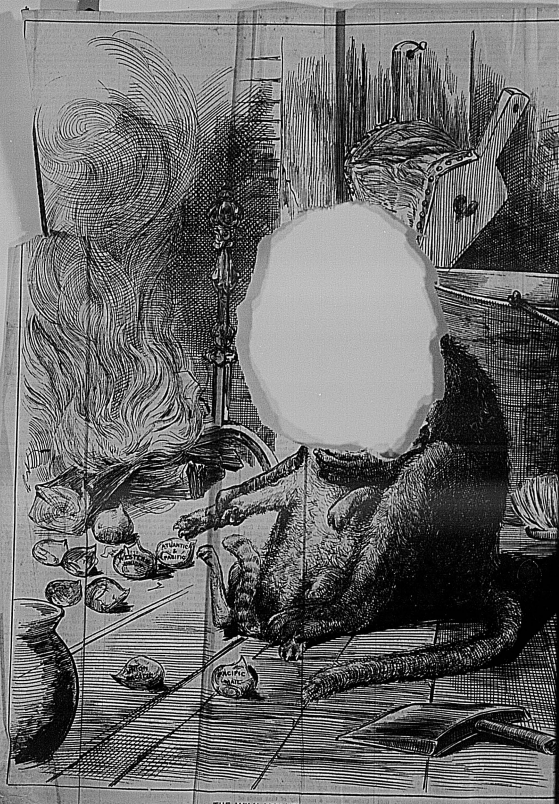
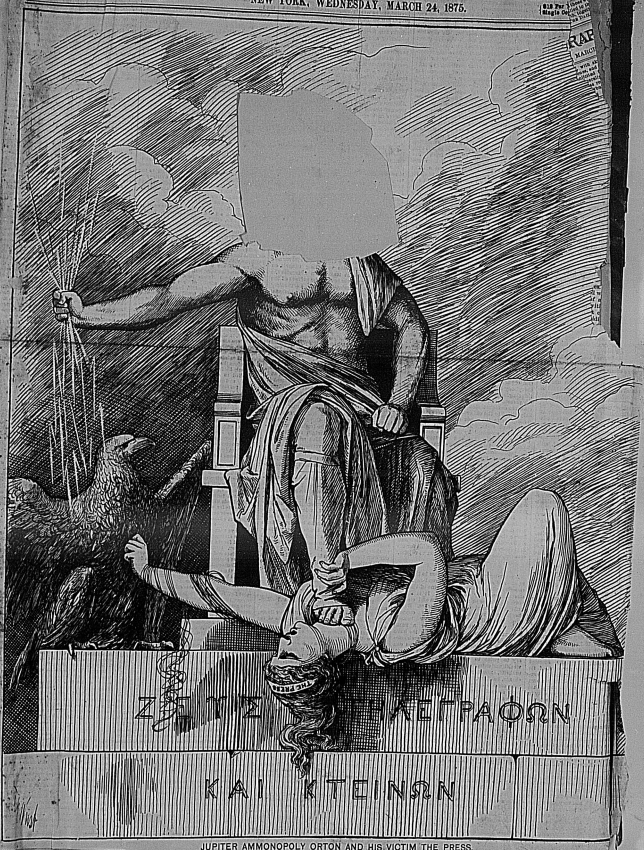


THE WILY MONKET AND THE DELUDED CAT.

A wily monkey, named John Gould, wishing to secure for himself some sheepmeats that others had placed to be roasted and to be eaten on Jennings-Darwes-Reid's [illegible] he [illegible] off and eat those sides; I will live upon [illegible] in the cupboard." Tabby did so, for she loved milk. "The mouse might suspect her, however, if she were to eat all the milk," thought she; "I will therefore only lick the outside of the jug—which thus was nicely burned—John pulled out the nuts. "I take no mouse might suspect her, however, as they were not their owners. Presently a mouse [illegible] and Twig, who was the thief, for she limped and [illegible] were, and everybody laughed when he thought of that how! about the immorality of the owners of



JUPITER AMMONOPOLY ORTON AND HIS VICTIM THE PRESS.

VOL. VII. All the News, Four Editions Daily. NEW YORK, WEDNESDAY, MARCH 31, 1875. $13 Per Year in Advance. Single Copies, Five Cents. NO. 642.

ST. JAY GOULD IN MONASTIC RETIREMENT.

"A monk's an owl and all
'a monk of Wall street dwell;
partners all his creed,
Is tell the golden bead;

Now collected on the end
Of Eagle's Pinion, widens his friend.
Fought down to the worldly sports—
Here are covered all his "shorts."

Now in heaven? much he "pray"
All his trust, "The truth's the way"
Hears many prayer and light may tone—
"Tis prayers, his souls 'a sad in lone.

NO. 642.

VOL. VII.

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NEW YORK, FRIDAY, SEPTEMBER 15, 1876.

THE GREAT TELEGRAPH WAR.

THE AUTOMATIC SYSTEM AND CHEAP TELEGRAPHY—THE LAND LINES—IMPENDING REVOLUTION IN THE TELEGRAPHIC BUSINESS—JAY GOULD'S IDEA ON THE NATURE OF A CONTRACT—OTHER MATTERS.

A short time ago it was announced that the Atlantic and Pacific Telegraph Company had purchased or obtained the control of the Automatic Telegraph Company, founded on the inventions of Mr. Edison and Mr. Little, and the system, it was then claimed, had recently been perfected so that from three to five hundred words a minute could be transmitted regularly over a single wire. Subsequently it was stated that with this system the cost of telegraphing would be reduced to one-tenth of that charged by telegraph at very low rates.

It appears that the object of the Atlantic and Pacific Company in use this system is now apparent. We have been informed that the new line from the representative of the Automatic Company obtained certain rights, and that some time obtained from this several interesting features of telegraphing, including the automatic and other systems of telegraphy.

From all we can learn, the principle of the direction and effects of the Automatic Telegraph Company are as follows:

The message is first prepared in printed form, in which it is punched in a manner to correspond with the dots and dashes in accordance with the system of the Morse alphabet. This is done by means of a machine operated by five keys, by which the operator punches the paper in such a manner as to form the dots and dashes of the Morse alphabet. The paper is then placed in the transmitting machine, which is operated by steam power, and which runs the paper through at the rate of 400 words per minute. The machine is so constructed that it will not work if the paper is torn or punched improperly. The paper is then run through the receiving machine, which is also operated by steam power, and which records the message in the Morse alphabet on a strip of paper. The receiving machine is also so constructed that it will not work if the paper is torn or punched improperly. The paper is then run through the receiving machine, which is also operated by steam power, and which records the message in the Morse alphabet on a strip of paper. The receiving machine is also so constructed that it will not work if the paper is torn or punched improperly.

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7

METALLIFEROUS DEPOSITS IN ALTAI, CHINA.

M. BERNHARDT DE COTTA has made a study of the metalliferous deposits of Altaï. These beds are extremely numerous, and may be counted by several thousands, if count is made of those only the existence of which has been preved. They are found chiefly in the western part of Altaï, in the neighbourhoods of Schlangenberg, Riddersk, Nikolajewsk, Belonssowosk and Siranowsk; nevertheless, there are some also in the southern part and near Salair. The eastern part of Altai is the least known, and no one has undertaken its exploration.

All the metalliferous deposits at present explored have, as M. de Cotta observes, certain common characteristics. They are most frequently irregular in deposit, but there are veins with large masses. They are generally imbedded in palæozoic lands, belonging to the Silurian, the Devonian, and the carboniferous series; being, for example, in schistose rocks, presenting alternations of grauwacke, quartz, schist of petrosilex or feld-spar, as also calcareous schist, in which Devonian fossils are found. They are met with much more rarely in crystalline schist, and they quite disappear in granite, in which there has not one mine been discovered. Yet, in the neighbourhood of the metalliferous deposits, there may generally be observed granite, porphyry and greenstone, the eruption of which seems to have given birth to them. Some mines have also been opened in solid porphyry; and, moreover, the beds are constantly traversed by veins of greenstone, tangite, porphyry, or trap.

The metalliferous deposits of Altai are ordinarily formed of sulphate of baryta, quartz, and metallic sulphites; but these last have been much decomposed; and to a great depth, and transformed by oxidation to cored minerals. Crystallised minerals are very rarely met with, and consists of products of decomposition of the secondary formation.

In regard to their yield of metal, they are distinguished as minerals of silver and minerals of copper, between which there is, nevertheless, no well-defined difference. The silver minerals ordinarily contain copper, a little gold, lead, zinc, and a great deal of iron; on the other hand, the copper minerals likewise contain silver and the other metals just mentioned. In the Sadowinski mine tellurium is met with, which is combined with silver and lead; but the metalliferous deposits of Altai present little variety in their minerals. The silver is in the state of native silver, of chloride, telluride, and sulphide, and is found also in the state of red silver, fahlerz, and argentiferous galena. The copper is in the state of native copper, sulphide of copper, variegated and ordinary copper pyrites, fahlerz, red and black oxide, copper pitch-ore, carbonate (malachite and azurite), and brochantite.

The gangue of the metalliferous deposits in Altai is characterised most particularly by the rarity of spathic carbonides and fluor spar. Besides, the ores never hardly contain cobalt, nickel, bismuth, antimony, arsenic, mercury, tin, or tungsten.

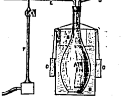
In the metalliferous beds of Altai there is no belted structure following the roofs, and generally the latter are not parallel; they are irregular deposits.

In conclusion, M. B. de Cotta has not a doubt that the metalliferous beds of Altai have been deposited by the waters which are held in solution by the ores necessary for the formation of the different metallic sulphides, as also the quartz and sulphate of baryta. If they are decomposed and changed to ochreous ore unto a great depth, it must be attributed to their not having been covered by the sea and more recent land formations; so that, since the emersion of Altai, which reaches to the carboniferous series, they have remained exposed to the changes of the atmosphere. It is known that great alterations are observed in the metalliferous localities of Cornouailles, the emersion of which dates from an equally distant period, which have gossan in their higher part.

Eng Mech — May 14 1875

A CHEAP AND EFFICIENT BLOWPIPE.

[9175.]—The object of the following contrivance is to lessen fatigue to the blower in blowpipe operations, and to do so more cheaply than by using foot-bellows, &c. Very little description is necessary. A is a common paraffin lamp shade (the larger the

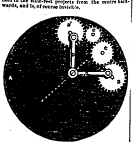


better) standing in any suitable vessel B, three-fourths filled with water. A is kept in one position by two heavy weights C, C. Into A a cork fitted with two tubes, as in figure, is inserted. The cross-tube, D, can be made out of a glass thistle-headed funnel-tube, the thistle-head acting as a trumpet mouth-piece. The other tube, E, is best made of metal. F is the gas. The action is obvious. Air is blown through D, all the excess air forcing the water out of A up into B. When almost all the water is forced out of it the lips may be closed, and several inhalations taken through the nostrils, the pressure exerted by the water in equalising the level in A and B keeping up a strong current through E. In this way the fatigue of blowing is reduced to a minimum. Zigeft.

TISLEY'S COMPOUND PENDULUM APPARATUS.

[7366.]—I have had my attention directed lately, by friends, to the curious and beautiful figures drawn by Tisley's compound pendulum apparatus, and I have, therefore, been induced to give an account of an invention of my own, made a good many years ago, which may, I think, be of interest, and, possibly, of more use than I ever conceived it likely to be. I never carried it to perfection, because my attention was diverted to the geometric chuck. But some years ago I mentioned the subject to several friends, all of whom seemed struck by the idea, and also to a London mechanic, whose name I forget, who had been, I think, a foreman of Evans, Wardour-street, and was recommended to me by Mr. Northcott. He advised me not to have it made, as he did not think it would produce so many or beautiful patterns as the simple geometric chuck, and if it was made strong enough to cut deep, would be more expensive. This I cannot see. The steps by which I reached the invention were these: I wished to produce something like Rose engine turnery, without the expense of a Rose lathe, so I tried first a circular-cutter, revolving at the same time as the lathe, and produced some pretty and curious patterns. I then thought if I could fasten a point at the end of an arm, that should be made to move backwards and forwards in a straight line, I could produce zig-zags. So I fitted up a mandril on the board of the lathe, parallel to the lathe-mandril, with a face-plate, with a slot in it, in which, at any distance from the centre, could be fastened a pin, on which one end of an arm worked, while the other was hinged to a slide, held in the rest, and carried the cutting tool. Then, of course, the lathe-mandril and this mandril being put in motion together, produced zigzags, the number and length of which were determined by the ratio of the two mandrils to one another, and the eccentricity of the pin. It then occurred to me that some curious effects might be produced, if another mandril was fitted up above the lathe-mandril, so that the three mandrils made a right angle with one another. Then if similar face-plates were made to both the extra mandrils, with the eccentric-pins, the arms, from which would, of course, meet in front of the lathe-mandril, or rather cross one another there, and if, where they crossed, they were connected by a pin, on which they could work freely; and if the parallel arm was carried on beyond the place it crossed and carried a tool, that some very curious figures indeed would be produced, and so I found to be the case. I thought then a separate machine might be made to be held in the slide-rest, the eccentrics to be actuated by a train of wheels, one of which should be set in motion by the overhead motion. The train of wheels might produce similar or different velocities. To test it I made one of wood, with the wheels and eccentricities as nearly as possible alike, and a pencil-point to draw the figures. The first figure it drew was exactly the same as Fig. 3 of Tisley's, in *Engineering*, of Feb. 4th.

In examining the matter more closely, I found exactly what he has found in the starting his pendulums, that the nature of the figure was modified by the position the eccentrics held in relation to one another when first started. I found, also, that if the wheels and eccentrics had been exactly similar, it would keep repeating the same line, and that that line would be anything from a straight line to a circle, and what it would be would depend on the position in which the eccentrics were to one another when started. If the eccentrics were in the parts of the wheels farthest from one another or nearest one another when started, it would be a straight line of both eccentrics were on the right hand, or both on the left hand at the same time it would be a circle, and in any position between these an ellipse. One of the wheels bears a shade smaller than the other. Of course the eccentrics kept taking different positions to one another, so that a figure of one line was produced, varying from a straight line to a circle, through all the phases of an ellipse and back at right angles to a straight line, but still being modified according to the position in which it was first started. Of course this figure can be produced, certainly by toothed wheels, one of which has one or more teeth than the other. Indeed all that is necessary is, instead of having two wooden wheels carrying eccentrics and actuated by bands, to have metal wheels with teeth, actuated by a train that joins them, and, no doubt, some very interesting experiments might be made,—so many different ratios and quantities may be established. There are equal quantities and equal eccentricities, but the eccentrics started from different position; then there are equal ratios, but different eccentricities, and these started at different positions, or different ratios and like eccentricities, are all different. I believe that any of Tisley's figures would be produced, and a great many others. If any one likes to experiment with this, some curious results will be produced. Partly want of time, partly having given myself to the geometric chuck, has prevented me, but if there is anything in the idea, it is as well it should see the light. I send a drawing of the face of the machine, as it would be to be held in the rest. The face drawn is what would be opposite the material to be cut, just as if you were looking at the face of ellipse cutting-frame. The shaft that is held in the slide-rest projects from the centre backwards, and is, of course invisible.



A, steel foundation-plate. B B', two wheels, carrying eccentrics. B, with pulley. C C, any connecting-wheels. D D, arms. The centre dot, where they are united, is where the cutting point would be. In its present position at starting, it will cut, if both wheels have equal velocities, a straight line in the direction of the dotted line. H. S. Savory.

GRAMME'S MAGNETO-ELECTRIC MACHINE.

Sir,—I wish to direct attention, through The Engineer, to a project which has of late been brought prominently into notice. It is now about two years since Gramme's patent magneto-electric machine was brought by some speculators, from Paris into this country. The novelty of this machine consisted in giving to the armature the form of a closed ring, wrapped round with a series of small coils of insulated wire, in such a manner that when the ring was caused to rotate before the poles of a permanent or an electro-magnet, a continuous and approximately uniform current of electricity was obtained. This form of armature, I would observe, possesses no practical advantage over the well-known forms contrived by Saxton and Siemens, when arranged to produce the direct current from a well-constructed commutator, but it has the disadvantage of requiring a commutator of complicated construction, and of not producing the alternating current now employed for lighthouse illumination. Had M. Gramme limited the exercise of his ingenuity to improving the magneto-electric machine of which he claims to be the inventor, it might have found a respectable place in the laboratory of the physicist as an instrument of research; but he and those associated with him have, for the purpose of bringing the invention into notice, adopted the principle of electro-dynamic accumulation to produce electric light from an electro-magnet, which, as is well known to those familiar with the history of electrical science, forms no part of Gramme's invention. With the view of giving further publicity to the Gramme machine, the promoters of the speculation obtained permission of the Board of Works to exhibit, at their own expense, an electric light from the clock-tower of the Houses of Parliament at Westminster, and with this semblance of Government patronage, aided by articles in the "Quarterly Journal of Science," and other publications, "The Electric Power Company (Limited)" was formed to purchase and work the Gramme invention. The nominal capital of this company was £100,000, out of which the promoters were to receive £65,000. As a small amount only of capital of this company was subscribed by the public—an amount which would appear to have been insufficient to repay the promoters for their venture—a new company has been recently formed, called "Gramme's Magneto-Electric Company (Limited)," with a nominal capital of £250,000. Out of this capital the vendors of the Gramme invention are to receive the modest sum of £145,000, and, to show confidence in the undertaking, they have considerately agreed to accept £35,000 of this amount in paid-up shares of the company.

I now come to the more important object of my communication. A short time since, Dr. Antonio Pacinotti, of the University of Pisa, was good enough to send me a reprint of his memoir "Sulle Elettro Calamite Trasversali," from the *Nuovo Cimento* of 1864, vol. xix., p. 378, which contains a description of an electro-magnetic machine with an armature in the form of a closed ring, wrapped round with a series of small coils of insulated wire, in the same manner precisely as in the machine of Gramme. The learned Italian professor states in his memoir that he had one of these machines constructed as early as 1860, for the Cabinet of Technological Physics of the University of Pisa, and that, with either permanent or electro-magnets, it could be used as a magneto-electric machine for producing a continuous current: "Una macchina magneto-elettrica con corrente continua," p. 383. The volumes of the *Nuovo Cimento* are to be found in the libraries of the Royal Institution, London, and other learned societies in Europe and America. The memoir is illustrated with an excellent engraving, from which it will be seen that Signor Pacinotti has anticipated most completely the communication of M. Gramme, entitled "Sur une machine magneto-electrique produisant des courants continus," published in the *Comptes Rendus de l'Academie des Sciences*, tome 73, page 175, 1871, as well as his English patent of 1870, No. 1668. What renders the Gramme scheme the more remarkable at the present time is the fact that, in the month after the appearance of Gramme's note in the *Comptes Rendus*, Signor Pacinotti sent his reclamation of the invention to the French Academy, where it was admitted, as will be seen by reference to p. 544, and to the index of tome 73, where it is described as "Une machine electro-magnetique construite en 1860 d'après le même principe que la machine de M. Gramme." It is scarcely necessary for me to state that, as Signor Pacinotti's memoir of 1864 is to be found in the public libraries of this and other countries, the knowledge therein communicated belongs to the commonwealth of learning, and cannot be made the subject of a valid patent. The publication of these facts, to which I have felt it my duty to draw attention, will, doubtless, prove of public advantage.

Alderley Edge, near Manchester, March 23rd. H. Wilde.

THE QUADRUPLEX TELEGRAPHIC APPARATUS.

A LETTER FROM MR. GEORGE LITTLE ABOUT ITS OWNERSHIP.

To the Editor of The Tribune.

Sir: As the inventor and patentee of the "American Rapid Automatic Telegraph system," now performing such effective service between Chicago, Buffalo, Albany, Boston, New-York, Philadelphia, Washington, and other important cities in this country, will you permit me to correct a slight error—or omission—in your issue of this date, in respect to arguments made before the Commissioner of Patents in Washington, yesterday.

The arguments were made by counsel on behalf of the Western Union Telegraph Company and the Automatic Telegraph Company, relative to the ownership of interest in what is called the "Quadruplex Patents," and all other patents and inventions owned or held in the names of Edison or Harrington, or both. Permit me to inform you that by virtue of agreements dated Jan. 8, 1872, and May 6, 1873, and recorded in Liber Z 13, page 44, Feb. 8, 1873, I own one undivided third part interest, besides the interest in my own patents for my automatic system. I therefore fail to see how Mr. Prescott, the electrician of the Western Union Telegraph Company, can hold the, or any, exclusive right under an agreement made during the Summer of 1874. George Little, Cons. Elec. Aut. Tel. Co.

Passaic, N. J., March 11, 1875.

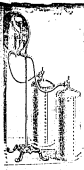
THE COST OF FOREIGN UNDERGROUND TELEGRAPHS.

To the Editor of The Tribune.

Sir: The absolute and the relative cost of aerial and underground lines for telegraphy appears to be the only unknown quantity in the current discussion of the subject. The cost of aerial lines suspended on posts has been given in official American reports as $115 per mile, including one wire, and $35 per mile for each additional wire. For underground lines copper wire is now exclusively used, and in estimating cost it must be considered that the resistance to the passage of the electric current increases with the length of the line, and that, on the other hand, the conducting power increases with the diameter of the wire. Consequently, to insure safety and speed of transmission, heavier wire must be used for great distances than for short lines, so that the cost increases with the length of the line.

The cost of the material being the principal element and alike in both cases, we shall have a positive element for comparison in the experience of the Prussian service, which is for a seven-wire cable, $1,230 (gold) per mile (English) for short distances, and $4,630 for the communication between remote cities. Through our cities, of course, the lighter wire may be used, but then the cost of excavation is greater, as is also the case to some degree for the aerial system. With the multiplication of wires, as required in New-York, a great comparative reduction in the compound price can, no doubt, be effected by the acknowledged mechanical skill of the country. This difference in cost certainly should not be any obstacle to the introduction of the reform system for short distances through the principal cities, especially in consideration of the freedom from interruptions and the reduction of the cost of repairs to a minimum. Adolf Cluss.

Washington, March 13, 1875.



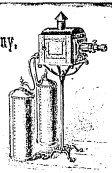
New York Calcium Light Company,

414 & 416 BLEECKER STREET,

AND

117 PRINCE STREET,

NEW YORK.



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Lieut. James Parmentel, Prof. of Mechanics.

...mbia College, New York:
Dr. Charles F. Chandler,
Professor of Mines.
Dr. C. A. Joy, Prof. of Chemistry.
Prof. Thos. Egleston, Prof. of Mineralogy.

...ell University, Ithaca, New York:
Wm. A. Anthony, Prof. of Physics.

...bert College, New York:
H. L. Smith, Prof. of Physics.

...ware State Agricultural College:
Wm. A. Anthony, Prof. of Phys. and Mech.

...gerstown College, Easton, Pa.:
J. H. Shimer, Prof. of Physics.
Dr. Parry Prosser,
Prof. of Min. and Mining.

...high University, Bethlehem, Pa.:
Dr. Wm. Chandler, Prof. of Chemistry.
Dr. R. H. Fracker, Prof. of Min. and Mining.

...Sheffield Scientific School, New Haven, Conn.:
C.S. Lyman, Prof. of Physics.

...University of Michigan, Ann Arbour, Mich.:
O. B. Saxonian, Prof. of Physics.
Dr. C. H. Peckham, Prof. of Chemistry.

...University of Pennsylvania, Philadelphia, Pa.:
Dr. C. F. Jenkin, Prof. of Physics.

...Vassar College, Poughkeepsie, N. Y.:
C.S. Farrar, Prof. of Physics.

...Washington University, St. Louis, Mo.:
S. Jackson, Prof. of Physics.
Wm. B. Potter, Prof. of Chemistry.

...Northwestern University, Ill.:
Prof. H. S. Carhart.

...University of Wisconsin, Minneapolis:
Prof. C. F. Dunbar.

...New York Medical College:
Dr. Hiram Hayes.
Dr. Charles F. Wurr.

...Brooklyn Heights Seminary, Brooklyn, N. Y.:
Mr. Tuttle H. Hamlin.

...Kenmore Hall, Newark, Pa.:
Prof. Ernest Leibert.

THE WALL STREET ORPHEUS.

Old Orpheus w'ith his merry crew
Made nimble kiss of stock and stone;
Our Orpheus, more up to-date genius,
Plays to the dance of stock alone.

THE WALL STREET ORPHEUS.

Old Orpheus with his query here,
Made nimble kine to eat dead stone;
Our Orpheus, more to profit prone,
Plays to the dance of stock alone.

AUTOMATIC TRANSMISSION.

No. X.

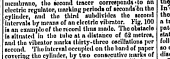
WE NOW proceed to consider some of the principal means of dealing with centre to centre line pneumatic tubes, arising from accident or disorganisation. The first of these causes which we select for notice is due to a train stopping in the tube. An arrest of this nature may arise either from an accident to the train, to the tube, or to the inherent sanitary operation. In such a case the air is generally very hard, and it is generally difficult to move the train, or to drive the train by forcing air through it. Fig. 96 represents a piston which drives back the train in the tube, and thus relieves it.

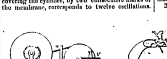
But when the carrier on the line itself has been damaged, the difficulty is greater; but here again a corrected pressure is generally sufficient to bring back the train intact or partially damaged. When this means fails nothing is left but to find out the position of the obstruction, and this may be easily ascertained with a very close approximation, at the station from which the train has been despatched. This is done by carefully observing the variations of the air pressure in the reservoirs, the valve of any placed in communication, first with a line of known length, and then with a line of unknown length, by application of Mariotte's law to the results obtained from the gauges. When 100ft. the position of the train would be reached. In the very rarely, however, that this operation is necessary. The daily records of the pressure gauges, and the practice which the employés acquire in constantly working the system greatly simplify the work of correcting accidents. It will be easily understood that if the journeys are made with certain pressures, which vary only between certain fixed limits, an empirical gradation of pressures may be obtained. By this means it is possible sometimes to ascertain the exact spot where the obstruction exists. If the method fails, however, the tube may be probed with a rod up to a distance of 100ft. or 200ft., according as the tubes are laid in a subway, or in a position where only a single one, instead of the two is always accessible.

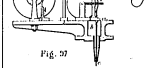
Several expedients have been designed for recording the exact position of a stoppage in the tube. Fig. 97 shows one of these, the invention of M. Bonnet. The piston unrolls a thread *a b c*, which passes from T over the pulley S. The quantity of thread which remains in the tube behind the piston is measured by the counter V, which is connected with the drum S. The thread being guided, and remaining always in tension, it is intended that the length unrolled should always represent exactly the point of the obstruction. Experience of this apparatus has not yet been obtained.

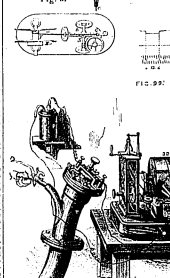
We turn next to a method which is only the adaptation to the special circumstances of M. Reynard's experiments to determine the velocity of sound in tubes, and to the study of those excitements made sufficiently in the mode of observing and recording the sound wave, on its arrival at the end of the tube. M. Reynard constructed an artificial ear with a membrane of caoutchouc, but far more sensitive than the human organ. When such a membrane is inflated by the impulse of a sound wave, the movement thus produced may be utilised to close an electric circuit, and by this means recorded the exact period when the sound reached its destination. The arrangement of this membrane is very simple, and is shown in Figs 99, 99. A thin band of slightly-vulcanised rubber, A B, is selected, and stretched between two metal clips, connected by screws which pass through the ends of the clips. In the middle of each metal clip is fixed by the centre of the membrane, which is a pointed screw B. An electric circuit is formed by C and D, which are closed by the inflation of the membrane. This latter carried by a bracket, is placed at the free end of the tube, so that the successive impulses can be registered on a recording cylinder by means of an electric current. A wave is produced in the pipe by fixing a plated piece near the membrane. This wave traverses the tube at the speed of 330 metres per second, and strikes against the obstruction, from which it is reflected, and traverses the tube in the opposite direction, inflating the membrane. If this means a first indication is marked on the recording cylinder.

The membrane reflects the wave towards the obstacle, which again returns it to the membrane, and thus a second indication is obtained on the cylinder. If then the interval of time between the first and second indication be accurately recorded, it is easy to determine the distance between the station and the obstruction. The chronograph with uniformly-moved is furnished with three tracing points; the first of these is placed in the circuit, which is closed by the successive inflations of the membrane, the second tracer corresponds on an electric regulator, marking periods of seconds in the cylinder, and the third subdivides the second intervals by means of an electric vibrator. Fig. 100 is an example of the record thus made. The obstacle is situated in the tube at a distance of 62 metres, and the vibrator marks thirty-three oscillations per second. The interval occupied on the band of paper covering the cylinder, by two consecutive marks of the membrane, corresponds to twelve oscillations.









The distance of the obstacle is then calculated by the following formula: $D = \frac{S \times 330 \times N}{2n} - 66$ metres,

so that the figure recorded by means of the rubber diaphragm approximates to the actual distance within 2 metres.

The first necessity is to ascertain the position of an obstacle by filling the tube up to the point of obstruction with water. This might, with careful measurement of the water, to give the exact position, but the method is somewhat primitive. It will be of interest to notice some causes of accident that have actually occurred.

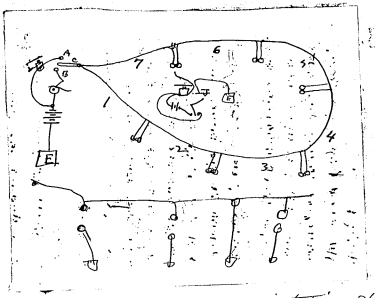
1. *The accidental Absence of a Pellet to the Train.*—In such a case the air acts directly on the carrier, and forces them apart in such a manner, that they arrive at their destination one after the other, either complete or with the cover removed, and with a portion of the despatcher left behind. The following train will probably sweep these stray letters through, but as instance has been known in which a dispatch remained several days in the tube before it was carried forward to the adjacent station.

2. *Forgetting a Train.*—This appears almost inconceivable; but such a thing has occurred, through carelessness on the part of the operator, in giving the Pneumatic signal before the arrival of the train. In one instance to which we may especially refer, the signal for a clear line being here given, although a train remained in the tube, a second train was despatched which could not but run on to the following station, while it remained behind; a third and fourth followed, each with the signal for the previous, and so on throughout the day, the accident having been discovered only in the evening.

3. *Breaking a Valve.*—The packing is fixed to the piston by means of a screwed rod, as already described. There is no occasion, if the screw fixed, the rod broken, and the valve was directly from hand and foot. Considerable difficulty was experienced in freeing the by which pistons were filled with hot water, and directed one after the other at the obstruction, which gradually yielded, and was forced forward to the adjoining station. The screw, however, remained behind, and to recover it, another piston was sent through it. tube at a very low speed, as manœuvres which succeeded perfectly.

4. *Accidents to the Tubes.*—Often the tubes are under the streets in positions where they are not frequently disturbed owing to repairs, &c., of water and gas mains, or even where they are exposed to the actions of street carts and the like. Under such conditions the tubes may be broken or distorted in form, and in either of these cases the traffic must of course useless for transmission purposes.

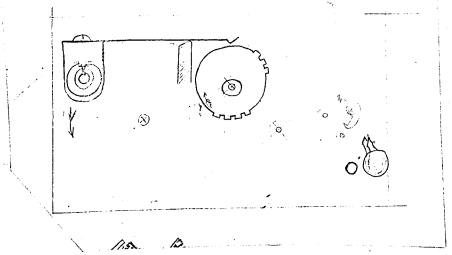
* See *ante* page 199.



Original idea of Edisons for test stations & instruments for 4th Semester 1st Co New York & from which I designed the units

Batchelor

Open & Inc June 27th 1875



No. 10

First sketch of Repeater for Domestic 1st Co's system of Fire alarm from Edisons ideas & from which the working drawing drawing was made.

Batchelor

Mr. Crookes began by stating that, in the paper which he had previously read to the society, he had made known how a lever arm of pith, delicately suspended in a vacuum, was repelled by the action of a beam of light or radiant heat. A great multiplicity of success in the experiments was to work with the highest possible exhaustion; experiments with partial exhaustion were suspected in glass vessels which had been exposed to the prolonged action of the Sprengel pump, which gives a far more perfect vacuum than can be obtained by the use of any other apparatus.

Until these experiments had been made it appeared that light had no effect on a lever arm of pith suspended in a perfect vacuum. Indeed, the circumstance that light could exert no influence on an exhausted bulb has quoted in standard scientific text-books as a proof that the repulsion of comet's tails is not in the least shaken by the discovery of the truth of Newton's emission theory of light. Mr. Crookes established a law of pith exposed in a vacuum thus far it has been fairly well established. When a beam of light falls on the pith, the side on which the light falls begins to retreat from the source, and gradually increasing in amplitude until the deflection was caused by the most powerful concentrated sunshine were used. The most powerful concentrated sunshine were used. The most curious circumstance, however, was that when the light was cut off the pith did not return to the zero position, but began to turn in the opposite direction, and so on alternately. These movements were kept up with the greatest regularity for hours, and even days, if left undisturbed. When a bead of a candle's piece of tin was placed near the bulb, one end of the lever arm came towards it as if attracted; but the truth was, as explained by Mr. Crookes, that radiant heat was thrown off from the candle in all directions in the room, and that the presentation of the piece of tin lessened the radiation on one side, consequently the movement was really caused by repulsion acting in the opposite direction.*

In order to show some of these effects Mr. Crookes now a piece of tubular glass apparatus in the shape of an inverted T, Fig. 1, containing a horizontal glass lever, suspended by a very fine glass thread. At the extreme end of the lever are attached a pith ball and a small disk of talc, respectively. In the centre of the lever was a small mirror, from which a ray of light was reflected on to a graduated scale, and thus the slightest movement of the lever rendered apparent. The T piece of apparatus just described could be connected. The arrangement which a glass thread possesses over a cocoon fibre is that the index always goes back to zero. The fibre used to suspend the lever is bent at right angles, and where the end of one of them is held in the hand the fibre usually curls upwards like a cobweb until the other end of it is drawn out vertically by the air.

As the vacuum becomes less perfect the repulsion of the pith ball is less, and there is a point of exhaustion where there is no action at all. If still more air be then admitted, attraction instead of repulsion sets in. The barometric pressure of the external point where this occurs is called the "critical point," at which the radiometer fails; it varies also with the rarity of its mass in its surface, and with several other conditions. Thus the neutral point for a thin surface of pith being low, while that for a relatively thick surface is high. Again, a surface of pith which is a conductor of heat is more sensitive to radiation between certain limits than pith will be repelled while platinum will be attracted by the same power of radiation. Mr. Crookes proved this experimentally by showing simultaneous action of a platinum and a pith disk in the bulb.

Various experiments were then made to prove some of the theories tried to account for the effects by the mutual action of fusible air currents or of electricity, but these theories were successively disproved by Mr. Crookes, and found to be absolutely incorrect. Professor Osborne Reynolds suggested that the movement might be due to thermometric actions exerted at the surface of the suspended body. Mr. Crookes then made a bulb with a disk of talc on one arm and a piece of difficultly fusible glass glass, platinity and

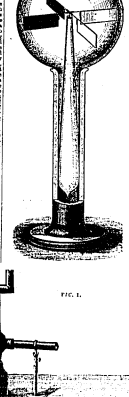


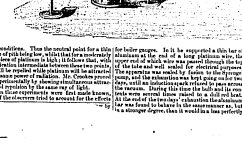
FIG. 1.

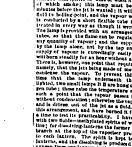
by the second action of fusible air currents or of electricity, these theories were successively disproved by Mr. Crookes, and found to be absolutely incorrect. Professor Osborne Reynolds suggested that the movement might be due to thermometric actions exerted at the surface of the suspended body. Mr. Crookes then made a bulb with a disk of talc on one arm and a piece of difficultly fusible glass glass, platinity and attenuated apparatus—namely, it was repelled by heat and attracted by cold, as was supposed by many.

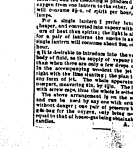
The most remarkable of all the facts made known by Mr. Crookes was an apparent difference between the action of radiant light and that of heat. The highest attraction for light was found when almost the highest repulsion for heat was found, and vice versa. When a pith disk and an pith coated with lampblack, the repelling colour with about the same force but, strange to say, the luminous rays repelled the black surface more than the white one. Again, when black and white were successively presented to the light reflected from a white surface, it might have been supposed that the consequent rebound would have repelled the white surface more than the black one. But the contrary was found to be the case, and Mr. Crookes constructed an instrument which he calls a "radiometer," and which excited much attention and blessed hail at the meeting of the Royal Society and the meeting last week. The apparatus is shown in Fig. 2, and consists of a glass bulb in the centre of four arms suspended on a steel point resting on an agate, so that the arms are able to revolve horizontally into their central point, but the same, in fact, as the arms of an anemometer reverse. To the extremity of each arm is attached a thin mica disk—that is, on the one side of each disk is a piece of pith white and on the other side black surface of all the disks facing the same way; the pith discs are each about the size of a sixpence. The whole apparatus is placed in a glass bulb, from which the air has been exhausted to the highest attainable point and hermetically sealed.

This arrangement rotates with more or less velocity under the actions of light. With one of the bulbs which Mr. Crookes exhibited some in 1872 seconds when a candle flame was placed at a distance of 24in. When the same candle was placed at a distance of 6in., one revolution in 6 seconds. When the candle was placed at a distance of 3in., 11 revolutions in a minute. It will be seen that the mechanical effect varies almost exactly inversely with the square of the distance, as that theory and experiment coincide.

Mr. Crookes considers that he has found to be very useful in quasi-neutral the effects of calorific radiation. The lighted sun burners in the roof of the hall of the Royal Society interfered with some of the results, and a candle placed intentionally near the apparatus was found to be very useful in overcoming the inevitably with which they were more with the intensity of the light. In these instruments we have a new form of actinometer. At present there is no good and scientifically exact method of measuring the intensity of solar rays, and many discoveries are possibly much in the production of a more perfect instrument for this purpose. The action of the radiometer is at present inexplicable on any recognised or narrowspread scientific theory.







THE LIMELIGHT SIMPLIFIED.

[1872.]—The introduction of the single form of limelight apparatus has rendered the "double" form obsolete. This is a less drain upon its practical resources, and is more easily put in and with a supply of common town gas, diverted from ordinary fittings into the gas-fitting in the pipes. There are many who have not the means of using the double form of apparatus, and to such the single form is known, under the name of the Oxyacetene Jet, where the hydrogen is replaced by a gas which costs but 3s. 6d. a cubic foot, and which is better than instead of the gas. There have been many attempts to produce a light by the use of the single jet, but hitherto have failed. It was the most desirable of any form of the limelight, and the one that required the least expense to produce it, and the most easily worked by any one. It is found by the photo world, and is in constant use of the war of getting lat-ensation. There, at first start, the most difficulties had to be met.

The apparatus shown gets over these difficulties in the simplest possible manner. A is a vessel made of stone ilo, to contain water. B is a tube which reaches to the top to terminal in a blow tube which will be seen at C. D is a tube which is connected with the gas and coal-gas supply, and which is filled with carbide, the naphtha—wood or mineral, petroline, benzoline, or any other.

Underneath this vessel is a lamp, which must be charged with spirits of wine or methylated spirits, one of which smoke; this must be lighted a few minutes before the jet is wanted; it will soon raise the heat of the vessel A to the point required. The jet is controlled by a tap, and will burn for a considerable period in every way as though it were ordinary gas. The tube is connected with an arrangement of pipes, through which the flame can be regulated to produce any quantity of light required, and it can be turned on and off by the tap, or by the jet in the room. The supply of vapour is constantly easily regulated, and the flame is steady, and free from smoke and offensive odour. There is, however, one point that requires attention—namely, that the jets being made of metal, they soon become heated by the vapour. To prevent this, a small tube is brought through the chamber the vaporiser is filled with water, which keeps the jet cool, and prevents the vapour from becoming too hot. The vaporiser is such a point that the vapour passes freely through it, and is not condensed. Mr. Crookes has patented this arrangement, and have it in use. I have tried it, and find it to be perfectly successful. I have worked with the double combustion system of wine and benzoline, and find the latter to be the most suitable. It is inexpensive, and gives a good light, and is very portable in each instance. The spirit is kept burning in it by means of a wick, which is produced by a small piece of cotton wick, which is in the centre. A single burner will consume 2½ d. of spirit per hour, besides the lamps.

For a single lantern I prefer benzoline, as it is cheaper, and more portable than spirits of wine. For the use of two lanterns I prefer spirits of wine, as for a pair of lanterns the vapour is so abundant that both lanterns will consume the same from one vaporiser.

It is desirable to introduce into the vaporiser a good body of cloth, in the vapour, to prevent a spurting that when there are only a few drops on the bottom. The cloth prevents this spurting. Jet is more applicable with the single form of jet. This is applicable to any form of jet. The whole apparatus is packed in a small compass, and is very portable. It is very simple, and can be used by any one who can manage a common lamp.

The above arrangement is the most practicable, and can be used by any one who can manage a common lamp. It is very simple, and can be used by any one who can manage a common lamp.

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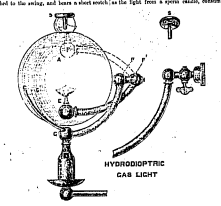
THE HYDROIDIOPTHIC GASLIGHT.

[1850.]—Were Argand's assistant now its master discouraged at the sticky combustions these produced by his carefully contrived and constructed burners, and determined to give up the whole concern, his assistant, took up a glass of plain tube and put it over the dull flame. The invention was by this accidental act perfected, and millions of the Argand burners have since been marketed without the little glass tube ever before thought of as valuable. What this chimney did for the Argand burner, a movable one carrying a gas-burner has lately done in America for the Hydroidiopthic Gaslight, a modification of the Argand flame, as for does the gas-light. It has served to light the soldier's task, placed before a fortifying rushlight—it has been used by the mathematician, and occasionally with important success by the lover. It has been found to be the light that can best be tempered so as to help and play its admirable and useful capacities.

It is a small chandelier, and on a three-arm principle, each arm movable freely, so as to acquire all revolution about a vertical axis without changing its place. One of the three arms supporting the globe is a gas-pipe furnished at its upper end with what is called the Hydroidiopthic gas-burner, which, as a result, if prolonged, pass through the centre of the globe, filled with clear water. Another curved arm is attached to the swing, and bears a short stretch



ing or gas-burner, using 6ft. of gas per hour. As the new burner on sets at right angles to that on which the whole apparatus turns, the two constituents of a universal light, and the light can be reflected at any angle with the horizon. The globe is filled with water, which is kept in its place by capillary attraction. The rays of light falling upon the water in the parent globe are scattered by reflection into a beam of light, which is thrown in every direction, and can be seen from a full house, or a town-hall, at a considerable distance, without the small illuminant to which the light of a radiant point is subject. The whole globe seems to be filled with light, and by it the whole room is illuminated. The light is found to keep much steadier in a room than the jet, it has much stronger illuminating power. A newspaper can be read in all directions at a distance from the globe when the burner is turned down to 1ft. of gas per hour, and 3ft. per hour is much the best. Your work-basket can be brought, every part of a room can be commanded. The full of light is kept steadily on the table, and the reader, without the pause of the darkness, the work by the table of the mechanic or amateur, the book of the student, or watchmaker, or engraver, or the poet, or watchmaker, or engraver, or the poet, or more—in fact, a dozen lesser trades—are better lighted than by any other single point. So that this apparatus furnishes the means of an brilliant an illumination as can be wished for any special purpose. Sculptors, plate, lacquers, and all who work in the light, will find it invaluable by means of this gas-burner. The light is natural that it is as good a day in the means of illumination by gas, as Argand's chimney and cylinder burner was to the illuminative by oil. The globe is filled with water, using a spherical lens, half ounce

subject to continuable spherical and chromatic aberration, these have no ill effects in this application of the law to illumination.

The spherical aberration which prevents the light from being concentrated in a focal field, and from the light from the centre-lines of a divided image of the flame. The chromatic aberration does not make it objectionable, for the colours are so blended that the light is a pure bright incandescence. The colours of silk, seen of yellow silks, come to be well brought out under it.

The light is fitted up in two forms—one portable, the other suspended from the ceiling. The portable form is for the use of an ordinary burner, already attached to a gas branch. The use of this enables the light to be shifted as well, from one gas branch to another, in the room or to another room. The suspended form is for the use of those who do not desire to be disturbed. It may be placed on each arm of a chandelier; each will furnish light upon a table for a separate reader or worker.

In all these cases the brackets over the light, and the whole is a safe supply light for all the readers in a family. The splint like wall of a chandelier is a luxury and convenience which will be found to be very useful. The light is also very convenient for reflection in the workshop, the grey or white walls and ceilings absorb so much light. This light is thrown direct from the work by the globe, and is not thrown upon the eyes. The light is thrown upon the work, and is not thrown from the air but from the globe, which is of a most convenient size, by a thrown photometer, 126 times as strong as the light from a spirm candle, consuming 120 grains of sperm per hour. This is the standard candle used in determining the value of gas, for illuminating purposes. The Parliamentary standard candle consumes 120 grains of sperm per hour. With the Argand burner, 10ft. of gas per hour. With the argand-centrating burner, the single 6ft. burner gives a light as great as the illuminated candle ten times stronger than the standard gas-burner—similar to the Argand burner, but with a flame of double the diameter—but 10ft. to the 10 standard burners.

In the figures herewith (1) is the glass globe 12in. in diameter, (2) is the gas-burner, (3) is the chimney, (4) is the metal pipe through which the water is admitted into the globe or bracket is permanent form; (5, 6 & 7) are screws which with (8 & 9) secure the globe in position.

(10) is the metal ball which carries an arm (if 11 & 12) to which is attached the bracket for the burner.

(13) is a stopper, a slice of this metal with a stem to be used for filling the globe with water, and for securing water-tight. If a cork or wax hole is made in the burner and insert tight, yet allow any surplus water expanded by heat of the jet to escape.

The water in the upper part of the globe gets heated, and as the heat is lost portion is sent to the surface in several hours.

The light is patented in the United States, but not in England or Canada. The inventor believes that it will shortly come into general use, believing that it will surely supersede, study, and work, better than any other light known. Better, too, for the display of goods in shops and stores, and windows. It is economical, as the light is thrown by the globe upon the work, and a gas burner of some size is thereby easily managed.

Washington, D.C., 10th May. Glimm.

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2 50..17 { Red Bluff, Redding, Red Wood City
2 80..19 { Rocklin, Roseville
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2 80..19 { Sargent's, Seama, Simpson's, Sheridan, Soledad
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25..2..Middletown
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50..3..Brighton
45..3..Cherry Valley
40..3..Enfield
30..2..Foxborough
25..2..Fall River
30..2..Indian Orchard
25..2..Lake Crossing
45..3..Leicester
50..3 { Lowell, Medford, Needham, North Dana, Spencer
25..2 { Springfield, Worcester

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1 00..7 { Ann Arbor, Albion, Banker's
1 25..8..Battle Creek
1 00..7 { Bay City, Big Rapids, Blissfield Junction
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1 25..8..Belding
1 00..7..Carleton
1 50..10 { Cedar Springs, Ceresco
1 30..9..Chadwick
1 00..7..Chelsea
1 75..12..Clam Lake
1 30..9..Coral
1 25..8..Columbiaville
1 00..7 { Detroit, Dexter
1 25..8..Dundee
1 30..9..Eagle
1 00..7..East Saginaw
1 25..8 { Fisher's, Fish Lake
1 00..8..Flat Rock
1 25..8 { Fowlerville, Grand Rapids, Grand Ledge, Grand Trunk Junct'n, Greenville, Gowen, Grosse Isle
1 65..11..Hanover
1 25..8 { Hemlock City, Hillsdale
1 30..9 { Howard, Howell, Hunstown, Ionia
1 00..7 { Jackson, Jonesville
1 25..8..Kalamazoo
1 65..12..Kingsley
1 30..9 { Kendallville, La Grange
1 00..7 { Lansing, La Peer
1 25..8..La Salle
1 75..12..Leroy, Osceola Co.
1 25..8 { Le Roy, Ingham Co., Lima, Livonia, Lyons
1 65..12..Manton
1 25..8..Maple Valley
1 00..7..Marshall
1 50..10..Martin
1 65..12..Mayfield
1 30..9..Mendon
1 25..8 { Metamora, Millington
1 50..10..Monteith
90..6..Montgomery
1 15..8..Morenci
1 60..11..Morley
60..4..Newport
1 25..8..Niles
1 00..7..North Lansing
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1 25..8..Oxford
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1 25..8..Plainwell
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1 30..9..Portland
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2 35..16..Ashland
2 00..17..Beatrice
[illegible]
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1 40..15..Crete
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1 50..17 { Battle Mountain, Beowawe, Brown's
3 00..20..Bullionville
2 50..17 { Carlin, Clark's, Elko, Golconda, Gold Hill, Halleck, Hot Springs, Humboldt, Independence, Lucin, Mill City, Oreana, Palisade, Peche, Raspberry, Reno, Rye Patch, Tecoma, Terrace, Toano, Verdi, Virginia City, Wadsworth, Wells, White Plains, Winnemucca

NEW HAMPSHIRE.

85..6..Amherst
75..5..Ashuelot
80..5..Bristol
50..3..Concord
75..5 { Dublin, Fisherville, Franklin, Harrisville
65..4..Hill
75..5..Hinsdale
50..3..Manchester
75..5..Marlboro Village
40..3..Milford
85..6..Mt. Vernon
50..3..Nashua
85..6..Petersboro
75..5 { Pittsfield, Suncook, West Swanzey
50..3..Wilton
75..5..Winchester

NEW JERSEY.

40..3..Atlanticville
25..2..Belleville
25..2..Bergen, Jersey City
30..2..[illegible]
25..2..Bound Brook
25..2..Camden
25..2..[illegible]
40..3..East Newark
25..2..Eatontown
25..2..Elizabeth
35..2..Franklin Furnace
25..2..Gedwinville
25..2..Hackensack
30..2..Hamburg
25..2 { Hawthorne, Highlands, Jersey City, Keyport, Lambertville
35..2..Long Branch
25..2 { Matawan, Midland Park, Monmouth Beach, Newark, New Brunswick, New Durham
25..2 { Newfoundland, Ogdensburg
25..2 { Old Bridge, Paterson
30..2..Pompton
25..2 { Rahway, Red Bank, Sandy Hook, South River
35..2..Stockholm
25..2 { Trenton, West End, Wortendyke
50..3..Woodside
25..2..Washington

NEW YORK.

75..5..Adams
60..4..Afton
25..2..Albany
50..3..Albion
75..5..Alexandria Bay
Amityville, L. I.
50..3..Amsterdam
60..4..Arcade
50..3..Auburn
Babylon, L. I.
60..4..Bainbridge
50..3..Baldwinsville
60..4..Barryville
Bayport, L. I.
Bay Shore, L. I.
60..4..Beaver Meadow
25..2..Bedford
Bellport, L. I.
50..3..Binghamton
60..4..Bloomingburg
60..4..Bouckville
Breslau, L. I.
30..2..Brewster's
25..2..Brooklyn, L. I.
50..3 { Brockport, Buffalo
Bushwick, L. I.
50..3 { Cadosia, Canajoharie, Canastota
75..5 { Cape Vincent, Central Bridge
60..4..Central Square
70..5..Centre Village
45..3..Centreville
50..3..Cherry Valley
75..5..Chestertown
60..4..Clark's Mills
75..5..Clayton
60..4..Cleveland
55..4..Clifton Park
50..3 { Clinton, Clyde
75..5..Cobleskill
75..5..Colliers
60..4..Constantia
50..3 { Cook's Falls, Cooperstown
Corinth
50..3..Cortland
60..4..Crawford Junction
55..4..Cresent
60..4..Dansville
50..3..Delhi
60..4..De Ruyter
70..5..Duanesburg
75..5..Dunkirk
Earlville
60..4..East Aurora
50..3 { East Branch, East Buffalo, East Guilford Junct'n, East Oswego
75..5..East Worcester
60..4..Eaton
Elmer
Eldyville
60..4..Ellenville
60..4..Elma
50..3..Fairport
45..3..Fallsburg
Far Rockaway, L. I.
50..3..Fort Plain
Franklin
60..4..Franklinville
50..3..Franklin Iron Works
Freeport, L. I.
50..3 { Fulton, Fultonville
75..5..Furnaceville
60..4..[illegible]
Glen Cove, L. I.
Great Neck, L. I.
50..3 { Guilford, Guilford Summit
60..4..Guymard
75..5..Hadley
Hamden
Hamilton
75..5..Hammond
50..3..Hancock
75..5..Hannibal
30..2..Harlem
50..3..Harpersville
Hempstead, L. I.
50..3..Herkimer
60..4..High Falls
50..3 { Hinsdale, Holland
60..4..Holmesville
75..5..Howe's Cave
25..2..Hudson
50..3..Hyndsville
50..3..Ilion
1 00..7..Irbua
Islip, L. I.
Jamaica
75..5..Jessup's Landing
25..2..Johnson's
60..5..Junc. C. & S. V. R. R.
60..4..Kerhonkson
25..2..Kinderhook
70..5..Knowersville
40..3..Lansingburg
45..3 { Liberty, Liberty Falls
50..3 { Little Falls, Lockport
75..5..Luzerne
50..3..Lyons
95..6..Machias
50..3..Macedon
Marcellus
60..5..Maryland
50..3..Medina
Merrick, L. I.
50..3..Merrickville
65..4..Mexico
Middleburgh
60..4..Middletown
50..3..Milford
60..4..Mongaup
60..4..Mottville
75..5..Morristown
50..3 { Morrisville, Moreston
60..4..Mt. Upton
55..4..Munnsville
60..4..New Berlin
50..3..New Hartford
70..5..New Scotland
50..3..Niagara Falls
90..6..Nineveh
60..4..North Bay
85..6..North Creek
50..3 { North Norwich, Norwich, Norwich Depot
75..5..Ogdensburg
90..6..Olean
50..3 { Oneida, Oneida Community
90..6..Oneonta
75..5..Ontario
50..3 { Oriskany Falls, Oswego
60..4..Otego
60..4..Otselic
80..5..Ouaquaga
50..3..Oxford
75..5..Palmer Falls
50..3..Palmyra
45..3..Parksville
Patchogue, L. I.
Pearsall's Corners
60..4 { Phoenix, Phillipsport
25..2..Port Chester
60..5..Port Crane
60..4..Pond Eddy
1 00..7..Portville
1 00..7..Pottersville
25..2..Poughkeepsie
90..6..Prattsburg
60..4..Pulaski
70..5..Quaker Street
25..2..Quarantine, L. I.
25..2..Red Creek
30..2..Rhinebeck
Richmond C. H., L. I.
Richmond Hill, L. I.
75..5..Richmondville
90..6..Riverside
50..3..Rochester
Rockaway, L. I.
Rockville Centre, L. I.
50..3..Rome
60..3..Rondout
75..5..Rose
60..5..Rosendale
75..5..Sandy Creek
50..3..Saratoga
Sayville, L. I.
45..3..Schenectady
50..4..Schoharie C. H.
60..4..Schroon Lake
60..4..[illegible]
60..5..[illegible]
Sea Cliff Grove, L. I.
50..3..Seneca Falls
60..5..Seward
Sharon Springs
60..5 { Sidney, Sidney Centre
50..3..Sidney Plains
70..5..Slingerlands
55..4 { Smith's Valley, Smyrna
75..5 { Sodus, South Corinth, South Oyster Bay, L. I.
65..4..South Wales
Sterling Junction
30..2..St. Johnsville
75..5..Stony Creek
60..3..Summitville
50..3 { Suspension Bridge, Syracuse
90..6..The Glen
65..4..Three Mile Bay
60..5..Thurman
50..3..Tonawanda
40..3..Troy
60..4..Truxton
90..6 { Tunnel, Unadilla
25..2..Unionville
50..3..Utica
40..3..Valatie
Valley Stream, L. I.
50..3..Walton
75..5..Washington
60..4..Waterford
75..5 { Watertown, Weavertown
25..2..West Albany
75..5 { Westfield, Westfield Flats
25..2..West Troy
60..4..Westmoreland
50..3..Whitesboro
25..2 { Whitestone, L. I., White Plains
75..5..Williamson
65..4..Windsor
75..5 { Wolcott, Wolcott Depot, Worcester
60..4..Wurtsboro
90..6..Yorkshire Centre
20..2..Yorkville, N. Y. City

N. CAROLINA.

1 00..7 { Charlotte, Gastonia, Greensboro, King's Mountain

OHIO.

75..5..Ashtabula
1 40..10..Belle Centre
1 00..7 { Bellefontaine, Birmingham
1 61..9..Carey
1 00..7 { Chillicothe, Cincinnati, Circleville
75..5..Cleveland
1 00..7..Clyde
75..5 { Columbus, Conneaut
1 00..7..Dayton
75..5..Elyria
1 15..8..Fayette
1 00..7 { Forest, Green Springs
75..5 { Geneva, Georgesville
1 00..7 { Hamilton, Ironton
1 40..9..Kenton
1 00..7 { Lockbourne, London
75..5 { Oberlin, Painesville, Plattsburg, Portsmouth, Sandusky, Springfield
1 00..7 { Tiffin, Toledo, Tremont, Urbana, Waverly
1 50..10..West Liberty

PROV. ONTARIO.

Acton, Alma Craig, Allanwood, Alma, Almonte, Amaranth, Angus, Arn Prior, Arthur, Aurora, Aylmer, Barrie, Beachburg, Beaverton, Belleville, Berlin, Bervie, Blyth, Bolton, Bothwell, Bradford, Brampton, Brantford, Brighton, Brockville, Brooklyn, Burritt's Rapids, Camlachie, Cannington, Carleton Place, Carillon, Charleston, Chatham, Chatsworth, Clifton, Clinton, Coburg, Colborne, Cold Spring, Collingwood, Cookstown, Cornwall, Courtwright, Dickinson's Landing, Dresden, Dundalk, Dundas, Dunnville, Duntroon, Durham, Elgin, Edwardsburg, Elora, Fergus, Flesherton, Forrest, Galt, Georgetown, Glencoe, Goderich, Goderich Harbor, Grafton, Grimsby, Guelph, Hamilton, Hanover, Hespeler, Holstein, Ingersoll, Iroquois, Kemptville, Kincardine, Kingston, Kleinburg, Komoka, Lancaster, Lindsay, Little Britain, London, Lucan, Lucknow, Luther, Lyn, Mallorytown, Manilla, Markdale, Marthaville, Masson College, Matilda, Millbrook, Mitchell, Meaford, Morristown, Mono Road, Morrisburg, Mount Forest, Napanee, Newbury, Newcastle, New Hamburg, New Lowell, Newmarket, Niagara, Oakville, Oakwood, Omemee, Orangeville, Orillia, Oshawa, Ottawa, Owen Sound, Pakenham, Parkhill, Paris, Pembroke, Perth, Peterboro, Petrolia, Picton, Port Colborne, Port Dover, Port Dalhousie, Port Edward, Port Hope, Port Lambton, Port Neuf, Port Perry, Port Robinson, Port Stanley, Prescott, Preston, Princeton, Renfrew, Richmond Hill, Riverside, Rockwood, Salem, Sandpoint, Sarnia, Seaforth, Shakespeare, Smith's Falls, Stayner, St. Catharine's, St. Mary's, St. Thomas, Stratford, Strathroy, Thamesville, Thorold, Thornbury, Thornhill, Toledo, Toronto, Trenton, Walkerton, Wallaceburg, Waterford, Waterloo, Watford, Welland, Wellington, Wellington Square, Weston, Whitby, Wilder, Wilkesport, Windsor, Wingham, Woodbridge, Woodstock, Wyoming

PENNSYLVANIA.

60..4..Allenwood
50..3 { Alaska, Annville
30..2 { Ashland, Auburn
50..3 { Bast Colliery, Beechwood Colliery
40..3 { Belmont, Phila., Birdsboro
50..3..Boston Run Colliery
55..4..Boyertown
40..3..Bridgeport
45..3..Bridgeport Lock
55..4..Brewer's Lock
50..3..Catawissa
30..2..Centralia
75..5..Centreville
50..3 { Chestnut Hill, Phila., Chadds Ford
40..2..Coatesville
60..4..Cold Spring
55..4..Collegeville
45..3..Columbia
45..2..Colorado
75..5..Conneautville
45..3..Conshohocken
60..3..Cooperstown
65..4..Cornwall
75..5..Cressona
50..3 { Danville, Dauphin, Donaldson, Doylesville
45..3..Downingtown
50..3 { Eagle Hill, E. Mahoney Junct'n, E. Pine Knot Colliery
70..5..Emlenton
75..5..Emporium
60..4..Ephrata
75..5..Erie
25..2 { Falls of Schuylkill, Fairmount Lock
50..3..Forestville
45..3..Frackville
35..2 { Frankford, Phila., Germantown, Phila., Germantown Junct'n
60..3..Gilberton
50..3..Girard Mam'th Coll'y
30..2..Girardville
40..3..Girardville Colliery
30..2..Glen Carbon
50..3..Gordon
45..2..Gray's Ferry, Phila.
55..4..Green Lane
35..2..Hamburg
65..4..Hall's Station
50..3..Harrisburg
60..4..Hellman Dale
55..3..Hellerstown
35..2..Hestonville, W. Phila
30..2..Hummelstown
45..3..Indian Ridge
25..2..Intersection, Germt'n
50..3 { Jalappa, Jonina
60..4 { Jonestown, Junction R. & C. R. R.
1 15..8..Keating's Summit
50..3 { Knickerbocker Coll'y, Kohinoor Colliery
45..3..Lancaster
50..3..Landisville
65..4..Laurel Iron Works
50..3..Lebanon
30..2..Leesport
80..6..Liberty Station
60..5..Larabee
50..3..Limerick
60..4..Lititz
50..3 { Locust Dale, Locust Gap, Locust Junction, Lofferry Junction, Lost Creek
30..2 { Mahanoy City, Mahanoy Plane
60..4 { Mahanoy Station, Mahanoy Tunnel
35..2..Manayunk, Phila.
60..4 { Manheim, McAuley
75..5..McCall's Ferry or Oretreville
75..5..Meadville
60..4..Merion
50..3..Middleport
60..4..Mifflin
75..5..Mill Creek Scales
50..3..Milton
30..2..Minersville
50..3 { McEnsville, Monocacy
60..4 { Mountzing, Montgomeryville
50..3..Mt. Airy, Phila.
50..3..Mt. Carbon
50..3..Mt. Carmel
55..4..Mt. Pleasant
45..3..Muncy
35..2..Moyerstown
New Hope
35..2..Newtown, Phila.
30..2..Norristown
North Brook
25..2..Northeast
75..5..Oil City
50..3..Oxford Coll'y, N. Mines
60..4..Palmyra
30..2..Palo Alto
55..4 { Perkiomen Junc., Pennsburg
45..3..Perry
25..2..Philadelphia
50..3 { Phoenix Park, Phoenixville
60..2..Pine Grove
85..6..Port Allegheny
30..2..Port Carbon
40..3..Port Clinton
45..3..Port Kennedy
35..2..Port Richmond, Phila
40..3..Pottstown
55..4..Pottstown Landing
30..2..Pottsville
40..3..Preston
45..3..Quakake, Junc.
60..3..Quarryville
50..3..Raven Run
30..2..Reading
60..4..Rheinoldts
35..2 { Richmond, Phila., Richmond Slope, Ph., Richmond Wharf, Ph.
45..3..Ridley Junc. or Ridley Park
50..3..Ringgold
60..4 { Ringtown, Robesonia
50..3..Rockville
45..3..Royer's Ford
50..3..Rupert
30..2..Schuylkill
55..4 { Schwenksville, Scaudtsville, Seed's or Seed's Stat'n
30..2 { Shamokin, Shenandoah City
80..6..Sheridan
90..6..Shippen
30..2..Silver Creek
60..4..Sinking Spring
45..3 { Spring City, Spring Mills, West
50..3..Stanhope Furnace
30..2..St. Clair
50..3 { St. Nicholas, Stony Creek, Strangville
85..6..Summit
50..3..Swatara
45..3..Swedeland
40..3..Tamanend
30..2 { Tamaqua, Tower City, Tremont, Trevorton
45..3..Tuckerton
50..3..Turkey Run Colliery
40..3..Tuscarora
60..4 { Union Forge, Union Colliery
45..3..Union R. & C. R. R.
50..3 { Valley Forge, Waynesburg Junct'n
25..2..West Philadelphia
75..5..White Deer
50..3 { Williamsport, Wrightsville, Wm. Penn
60..3..Carbondale
Griswold
60..3 { Hawley, Honesdale
60..3..Lackawaxen
60..4 { Olyphant, Rushdale
60..3..Scranton
60..4..Waymart
60..4..White Mills

PROV. QUEBEC.

75..5 { Berthier, Black River, Bentwood, Buckingham, Cap Sante, Champlain, Chaudiere, Coteau Landing, Gananoque, Grace's Point, Grenville, Grondines, Hull, Jacques Cartier, Joliette, Lachine, Mascouche, Monte Bello
60..4..Montreal
75..5 { North Nation Mills, Papineauville, Point aux Trembles, Portage-du Fort, Quebec, River-du Loup (up), River-des Prairies, St. Andrews, St. Ann's, St. Eustache, St. Hermas, St. Vincent de Paul, Terrebonne, Three Rivers, Thurso

RHODE ISLAND.

25..2 { Newport, Providence, Pawtucket

SOUTH CAROLINA.

1 25..8 { Branchville, Charleston
1 00..7..Chester
1 25..8 { Columbia, Centre of Road, Fort Mills, Gaffneys, Greenville, Orangeburg, Rock Hill, Seneca City, Spartanburg
1 00..7..Winnsboro
1 25..8..Yorkville

TENNESSEE.

1 25..8..Chatanooga

UTAH.

2 50..17..Almy
3 00..20..American Fork
3 50..23..Beaver
3 00..20..Bingham Junction
2 50..17 { Blue Creek, Bonneville
3 00..20..Brigham City
2 50..17..Castle Rock
3 50..24..Cedar City
2 50..17..Corinne
3 50..23 { Cove Creek Fort, Draper, Diamond City
2 50..17..Echo
3 05..20..Ephraim
2 50..17..Evanston
3 00..20..Farmington
3 25..22..Fairview
3 50..23..Fillmore
3 25..22 { Fountain Green, Franklin
3 50..23..Goshen
3 00..20..Granite
3 25..22..Gunnison
3 35..22..Hampton
3 50..23 { Hebron, Kanab, Kanarra, Kanosh
2 75..18..Kaysville
2 50..17..Kelton
3 00..20..Logan
2 50..17..Lucin
3 25..22 { Manti, Mona, Moroni, Mount Pleasant
3 00..20..Nephi
4 00..27..North Star
2 50..17 { Ogden, Ophir
3 50..23..Parowan
3 00..20..Payson
2 50..17..Peterson
4 00..27..Pine Valley
2 50..17..Promontory
3 00..20..Provo
3 25..22 { Richfield, Richmond, Rockville
2 50..17..Salt Lake City
2 75..18..Sandy Station
4 00..27..Santaquin
3 50..23 { Scipio, Silver City
3 25..22..Smithfield
3 75..25..Spanish Fork
3 25..22 { Spring City, Springtown
3 00..20..Springville
3 50..23..St. George
3 10..21..Stockton
2 50..17..Terrace
3 50..23..Toker
2 50..17 { Toele, Uintah
3 00..20..Utah North Junct'n
2 50..17..Wahsatch
4 00..27..Washington
3 40..23..Weber
3 25..22..Wellsville
4 00..27 { Willard City, Winsor Castle

VIRGINIA.

50..3..Alexandria
75..5 { Charlottesville, Danville, Gordonsville, Ivor, Lynchburg, Manchester, Norfolk, Petersburg, Pittsylvania C. H., Portsmouth, Richmond
60..4 { Suffolk, Wakefield
1 00..7..Waverly
75..5 { Windsor, Zuni

WISCONSIN.

1 10..7..Milwaukee

WYOMING.

2 80..19..Archer
3 25..22 { Aspen, Bitter Creek
3 50..23..Black Buttes
3 25..22 { Bridger, Bryan
2 95..20..Buford
2 50..17..Carbon
3 25..22..Carter
2 50..17..Cheyenne
3 25..22..Church Buttes
3 00..20..Como
2 80..19..Cooper's Lake
3 25..22..Creston
2 50..17..Fort Bridger
3 00..20..Fort Steele
3 25..22..Granger
2 80..19..Granite Canon
2 50..17..Green River
2 80..19..Hazard
2 95..20 { Hilliard, Hillsdale
2 50..17..Laramie
2 80..19..Lookout
3 05..20 { Medicine Bow, Miner
3 25..22..Piedmont
2 85..19..Pine Bluffs
3 25..22..Percy
3 50..23..Point of Rocks
2 50..17..Rawlins
2 80..19..Red Buttes
3 25..22..Red Desert
3 00..20..Rock Creek
3 50..23 { Rock Springs, Salt Wells
3 25..22..Separation
2 80..19..Sherman
3 00..20..St. Mary's
3 25..22 { Table Rock, Tipton, Washakie
2 50..17..Wyoming

We PROVIDE the PUBLIC with PROMPT MESSENGERS as WANTED, DISPENSING with BOYS, SELDOM required, although under PAY.

CASH TARIFF OF THE DOMESTIC TELEGRAPH CO.
MESSENGER SERVICE.

Measure the distance on this Map to where the Messenger is to go. The charge is:

8 cents for each inch when the distance is **3** or less inches.
7 cents for each inch when the distance is from **3** to **5**$\frac{1}{2}$inches.
5 cents for each inch when the distance is **5** or more inches.
No charge less than **10** cents. Reckon fractions over an inch as a full inch, thus, 4$\frac{1}{2}$ inches would be charged 6 inches.
Above 59th Street, calculate 5 blocks to the inch. Messengers are provided with a Map of Brooklyn and Jersey City.

CAB FARE ADDITIONAL.

ELECTRIC WAVES UTILIZED.

THE WONDERFUL INVENTIONS OF MR. THOMAS A. EDISON.

Recording Three Thousand Words by Telegraph in One Minute—Transmitting Four Messages Over a Single Wire at the Same Time—Marvellous Mechanical Ingenuity.

For nearly ten years Mr. Thos. A. Edison of Newark, N. J., has applied himself to the invention of telegraphic systems and instruments. Last year he perfected what is known as the American automatic system, which is in use on the lines of the Atlantic and Pacific Telegraph Company. This system is based upon his discovery that the rapidity with which electric waves can be transmitted over telegraphic circuits is practically infinite and that telegrams can be transmitted at great speed if suitable apparatus can be devized to transmit, record, and overcome certain interfering phenomena which arose to reduce the rapidity.

A number of experiments upon the Atlantic cable had previously been made by the scientists connected with the United States Coast Survey in the determination of longitude, in the course of which it was found that the time which it took for a wave of electricity to travel from Valencia, Ireland, to Heart's Content, Newfoundland, was less than one one-hundredth of a second. This is not strictly the accurate time, as the passage of the electricity through the copper core of the cable acts inductively on the iron sheathing and water outside, and a secondary current of electricity is set up, which reacting upon the primary current passing through the core of the cable neutralizes it for a time, and prevents the appearance of the signal at the distant end. It is admitted by experimental electricians that a message composed by the transmission of long and short waves of electricity through the cores of the Atlantic cable, from the battery at Valencia to Heart's Content, for example, returns through the earth to Valencia, and thus forms an electric circuit. If it was possible to discover a means by which the secondary currents set up by the passage of the primary signalling current through the Atlantic cable could be neutralized or accurately compensated for several thousand words a minute could be transmitted, and messages could be sent from New York to London for what they cost from New York to Philadelphia.

On land telegraphs the same phenomenon of secondary currents presents itself, but in an infinitely smaller degree, for in this case the suspended wire must act inductively through many feet of earth, and the strength of these currents increases in proportion to the close proximity of the earth and line.

ELECTRIC WRESTLING.

In 1871 Mr. Edison invented a system of compensation for these secondary currents, which although inapplicable to submarine cables, was successful upon land telegraphs. The principle is thus briefly told in his own words: "I found on trying to transmit waves from Washington to New York that the passage of the current over the wire set up a secondary current, which passed in a direction that mutilated the signals. It then occurred to me that if I could attach any device to the wire which also by the passage of the signalling wave would set up a secondary current passing in the opposite direction to the other secondary current, the two would balance or "wrestle" telegraphically with each other and leave the signals to come clear and sharp. Such a device was soon found. It consists of an iron ring, upon which is coiled a long fine insulated copper wire, a number of them being placed along the line at intervals of several miles, one end being connected to the wire and the other to the earth. A small part of the main current passing through the wire acts inductively on the iron rings, in the way that the current on the wire acts on the earth, but in the opposite direction, and the two neutralize each other.

On the wire between New York and Washington, 3,150 words have been transmitted and legibly recorded in one minute. The average word consists of five letters, and each letter of four waves, making it necessary to transmit sixty-three thousand waves in a minute, or a little over one thousand waves a second. The message to be transmitted is on a long strip of thin paper, about half an inch wide, in the centre of which, and running from end to end, are groups of holes. A large hole serves to transmit a long wave, or dash, and a small hole transmits a dot. This strip is prepared with great rapidity by an operator seated before a machine having a key board like that of a piano. After the paper is prepared it is taken to a machine connected with the wire. This machine is a simple metallic flanged wheel, turned by a crank, upon which the paper rolls, and is carried forward as the wheel revolves. This metallic drum is connected with the battery. Resting upon the paper in line with the row of holes is a lever, with a smaller roller at its end. This lever is connected with the telegraph wire. If the paper is passed rapidly through this machine, the intervention of the paper prevents the little roller from coming in contact with the drum underneath (paper being an insulator of electricity), but the moment a hole passes, the small roller comes in contact with the drum, and connects the battery with the line for a period of time proportionate to the size of the hole. With this arrangement almost any speed of transmission is mechanically practicable.

RECORDING 1,000 TIMES IN A SECOND.

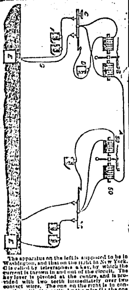
The most curious part is the method of recording the message at the distant station. A metallic drum driven by crank motion, similar to that in the transmitting machine, carries a continuous strip of paper moistened with a solution of Ferri cyanide of potassium. The drum is connected with the earth, and a small piece of iron wire connected with the telegraph line rests on the moistened paper. When a wave of electricity comes over the line it goes down the small iron wire resting on the prepared paper, and then through the paper to the wheel underneath and to the earth; the current resolves the water into its primary elements—oxygen and hydrogen—and the oxygen (which is in a peculiar state called nascent) instantly attacks the iron point, forming oxide of iron. This oxide instantly combines with the Ferri cyanide of potassium and forms Prussian blue—the basis of many writing inks. If the wave is short a small blue dot is formed, if long a long mark or dash is made, and the combination of the dots and dashes forms the letters of the Morse alphabet. The point of an iron wire is thus rusted and cleaned, and a new and colored compound formed 1,000 times in a second by a force 200 miles away.

The system for a long time received little encouragement from the telegraph managers. Gen. T. T. Eckert, formerly superintendent of the Western Union Telegraph Company, was the first prominent telegrapher who saw that it was to be the telegraph of the future.

Mr. Edison has been engaged for several years in endeavoring to increase the speed of Morse transmission by methods radically different in principle from those of the automatic, and has accomplished practically what was for a long time considered impossible. More than twenty years ago Gintl, a German electrician, devised a plan for transmitting two messages over a single wire in opposite directions at the same time, and others since that time have tried the same thing, but no success was attained until Edison in 1865 and Stearns in 1869 brought out their systems. Mr. Stearns's system was purchased by the Western Union Telegraph Company in 1872, and was at once put to use on their lines, proving of immense value by doubling the carrying capacity of all the main circuits.

DUPLEX SYSTEMS.

The principle upon which all duplex systems of telegraphing are based is shown in the diagram below:

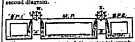


The apparatus on the left is supposed to be in Washington, and that on the right in New York. C is called by telegraphers a key, by which the current is thrown in and out of the circuit. The key lever is pivoted at the centre, and is provided with two teeth immediately over two contact wires. The one on the right is in connection with the earth by the wire G; the one on the left to the battery, F, the lever being connected with the line wire. Upon the extreme end of each key lever is a flat spring, which can be made to touch another contact point connected with a battery, D. When neither operator is transmitting, both key levers rest on the points connected with the earth, thus completing the circuit, but without any battery being included in it. The flat springs are also disconnected from their contact points, cutting off the local battery from the balancing magnets at each station. The spiral adjusting springs, when the battery is thus disconnected, draw the lever carrying the iron bar away from the limiting screw on the right of the magnets between which it is placed. Both stations are now ready to receive a message. We will suppose that the operator in Washington depresses his key, C. The lever to which the line is connected is separated from the point connected to the earth wire, G, and placed in contact with the battery, F, the current from which passes over the line, and through the magnets on the right in New York, thence to the earth through the key lever and earth wire. The cores of the magnets attract the iron piece connected with the lever, and are sufficient to overcome the power of the spiral springs, and the sound which it gives in striking the limiting screw conveys to the ears of the operator a "Morse" signal.

The current from the battery, F, in Washington, passes through the magnet, B, also, and its lever would be attracted were it not that at the moment when the attraction of the cores commences the current from the local battery, D, acts upon the wires of the opposite magnet and sets up a counter attraction, which exactly balances that from the main battery, on the same principle as placing two equal weights on the pans of a druggist's scale at the same instant—the beam showing no movement. By this second magnet and battery, D, the receiving instrument, B, remains unaffected by the signals sent from C. But the current going to the distant stations does not bring into action the local current and battery, hence the balancing effect does not take place, and the lever is attracted. Now, if the operator in New York transmits, he throws in the circuit another battery, which sends a current in the same direction as that of the battery in Washington. The effect of this battery upon the receiving instrument is neutralized or balanced in the same way as in Washington, but the extra current acts on the magnet, B, in Washington, and gives it a strength double that of the magnet on the opposite side of its lever; hence the lever is attracted by B, and the signal is made.

THE PRINCIPLE ILLUSTRATED.

This principle is illustrated by a system of water pipes and water, which is shown in the second diagram.



We suppose one part of the water telegraph, by which the electric wave is illustrated, to be in Harlem, and the other end in Wall street. A is a reservoir containing a force pump, by which a constant stream of water may be forced into the pipe M P, at the same time throwing a like stream into S P 1. The water thus thrown into the systems of pipes is insufficient to fill them. B represents a similar reservoir and pump, which throws a stream into the secondary pipe S P 2, and another stream through the main M P in the same direction as the flow from A, the two streams thus forced into the main, filling it. W is a water wheel so situated as to be operated upon by the currents in either circuit. To this wheel is attached a lever, moving between two fixed points, and provided with a retractile spring to hold it against one of these points. X is another wheel, similar to W in all respects. By suitable mechanism a stream of water can be made to circulate quickly in the main and the two secondary circuits. If these two intermediate streams are made to flow from A into the main and secondary pipes, it is evident that that part of the water flowing within the main pipe will, by acting upon the leaves of the wheel W tend to rotate it in the direction of the flow, while that part going through the secondary will operate with equal force to rotate it in the opposite direction, thus causing it to remain motionless, there being an equal amount of power applied on each side. But this is not the case with the wheel X, as no water from A can pass into S P 2, no such balance is maintained by X, which is therefore rotated in the direction of the flow in the main, causing the lever to overcome the force of the retractile spring, and rest against the opposite point. If the flow from A now ceases, the lever of X is instantly drawn back to its original position. It follows that the wheel X can be affected by the flow from A, but that W cannot, and that signals could thus be received from the lever of X by the sound of its contact with the points. Water projected into the main pipe from B, which otherwise affects the wheel X, is balanced by an equal amount flowing into S P 2, and this flow from B, passing within the main, so increases the volume in it as to destroy the balance maintained upon the wheel W by the streams projected from A, and causes it to rotate with the stronger current. It is thus seen that the flow from A affects only the wheel X, and that from B the wheel W, by the balancing properties of the secondary pipes; and that the flow in the main circuit is in the same direction, whether projected by A or B, and that it is the increase and decrease of the volume of the current that permits simultaneous signals to be given, apparently in opposite directions. This apparatus is precisely similar to that of the duplex system, in the latter electricity being substituted for the water, and electro-magnets for the water wheels.

A WONDERFUL DISCOVERY.

Mr. Edison's crowning discovery was bringing to light the fact that by a peculiar manipulation of the electric currents four messages can be transmitted over a single wire in various directions at the same time. This apparatus was called by the inventor the Quadruplex. It is used by the Western Union Telegraph Company, and according to Mr. Orton's last report solves the most difficult problem presented to a telegraph manager—how to meet natural increase in business without a corresponding outlay for wires. For this invention the inventor was offered by that company twenty-five thousand dollars cash and a yearly royalty amounting to nearly twenty-two thousand dollars.

In transmitting four messages over a single wire at the same time, four receiving magnets are used—two at each end of the line. Two of these magnets are of the ordinary kind, and respond to currents of a certain strength, independent of the direction in which they flow. The other two respond only to a change in the direction of the currents independent of the strength. A magnet of each kind is put at New York and Washington, and both are so arranged with extra magnets that the transmission of a weak or strong battery current over the wire from New York to Washington through the magnets in New York has no effect upon them. But the current acts upon the ordinary magnets in Washington and a signal is transmitted; if the direction of the current is reversed in New York the other magnet in Washington responds, and another distinct signal is transmitted. While these two distinct signals are being sent to New York from Washington the latter may in the same way transmit two distinct signals from New York. The action of the currents in the line wire itself is complicated, yet no two currents pass each other in opposite directions at the same time, according to the inventor. Electricians differ, however, on this point, some holding that the currents go through the ground, and others saying that an indefinite number of currents can pass upon the same wire.

MR. EDISON'S WORKSHOP.

Mr. Edison is not yet thirty years old; but for the last six or eight years his name has been well known in the telegraphic world. His many inventions of both instruments and systems have done much to simplify, cheapen, and advance telegraphy. His factory in Newark is in a four-story brick building in Ward street. The first story containing the laboratory is a little telegraphic world. Scientific apparatus of every conceivable shape lies scattered about. Cabinets of rare chemicals and chemical apparatus and wires extending in every direction. In one corner is a telegraph instrument connecting the factory with New York and Washington. In another corner is a desk covered with books labelled "Experiments," "Chemicals," "Notices of the Press." The upper stories are filled with lathes, planers, and screw machines. In the second story Stock Exchange indicators are made, in the third automatic instruments, and the fourth is devoted to the manufacture of experimental apparatus.

16

District No._____ New York, _____ 187

_____ Street.

M_____

To THE DOMESTIC TELEGRAPH CO., Dr.

General Office, 12 Vesey St.

To Messenger or Police service from _____ *to* _____

To rent of Signal Instrument, from _____ *to* _____

_____ *Vouchers Ref'd.*

Received Pay for The Domestic Telegraph Company,

By _____

N. B.—If found correct, please call a Messenger and pay this bill no charge being made for such service.

Pollock Bros. 1825 26 May to June 30

NOTICE

Will be given WHEN this Instrument is READY for use—and until such time please

NOT DISTURB IT.

Respectfully, &c.

12 Vesey Street. THE DOMESTIC TEL. CO.

C. J. OSBORN & Co.,

BROAD STREET,

By Telegraph from

New York Dec 30 1875

To Chas.

440

190 Broad

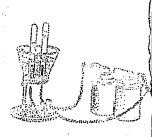
When will you have my

Stock certificates written

Yours

The Automatic Fire-Alarm Telegraph.

The efficiency of fire as an automatic telegraph operator was effectually demonstrated at the Mercantile Library rooms, Astor Place, on the morning of 27 and 28 March ultimo. At 7 o'clock, A. M., an automatic despatch was received at the Murray street fire-insurance patrol station, giving notice of a fire in the sub-cellar of the Worth street building. The patrol responded, immediately, and reached the building within three minutes after receiving the alarm, but finding that the fire was obtaining rapid headway the patrol called the Fire Department by their assistance. A second alarm was received at the patrol station from the basement of the building, at five minutes past 9 o'clock, A. M., and the patrol responded, but the fire had continued to increase in power, the fire had continued to increase in power, the fire had continued increasing for some hours before it became a flame that received sufficient heat to fuse any of the thermostats (which were set at 90 degrees and thirty degrees), and thereby transmit the alarm. It is only necessary to say that this timely service was performed through the agency of the Automatic Fire-Alarm Telegraph system, which connected below with the insurance patrol and facilitates efficient co-operation with the Fire Department, when the building of which is burning. We have been so long convinced of the utility of this system that we have had it applied to the new building of the Riverside Piler. Not only will a fire in this building be confined to the apartment where it originates, by the fire-proof qualities of the building, but in whose ever room it may break out, and this damage is fortified, by the door closers, &c., will be prevented.



TRANSFERS.

J. W. Pettis	Tallahassee, Fla.	Lake City, Fla.
J. C. Hall	Jacksonville, "	Tallahassee, "
J. A. Lamb	Lake City, "	Jacksonville, "
W. H. Sanford	Savannah, Ga.	Atlanta, Ga.
J. C. Hall	Tallahassee, Fla.	Jacksonville, Fla.
J. A. Lamb	Jacksonville, "	Lake City, "
W. H. Sanford	Atlanta, Ga.	Savannah, Ga.
J. W. Pettis	Lake City, Fla.	Tallahassee, Fla.

FIGURES PRINTED BY LIGHTNING.

Persons who are killed by lightning stroke are frequently found marked about the body in a peculiar manner, being generally discolored in streaks on the trunk and branches of a tree. In case the mortality actually happens any where in the vicinity of a tree, the manifestations are attributed to such mysterious property of the lightning, which proclaims on the body (as was stated in a published instance) "the fibres, leaves and branches with photographic accuracy."

Mr. C. Tomlinson in a communication to *Nature*, states that the trees have nothing to do with the figures, which are produced directly by the lightning. The same markings may be found in shocks of crown glass by passing a charge over them from one end of a Leyden jar. The writer, however, considers a variety of curious phenomena in which horseshoes, metallic numbers, etc., have been found reproduced on the persons of those struck in their neighborhood. Mr. G. F. Varley throws light on these last mentioned cases in giving the record of an accidental observation made during the working of a Holtz electrical machine, the action of which were furnished with brass balls under all, both in diameter. Nothing could injure the ball but the positive pole. Mr. Varley pitted its polar face all with a silk handkerchief, and in vain. He then examined the negative pole, and found a minute spark corresponding to the pole of the positive pole. This spark was scarcely visible to view; and if in this case one or two hits of wet or even a drop or two of water, be placed on the negative pole, corresponding to the minute spark spread on the positive pole. Hence it is evident that flow of force exist between the two poles by means of which we may telegraph through the air from the negative to the positive pole. And the explanation of the above cases, in which the figures burn on the skin is of the same nature as the experiment which, we charge pre-supposed, all that is necessary is that the object be to the same stock, were similar, etc., the discharge being a negative one.

ELECTRICAL PROPERTIES OF THERMAL SPRINGS.—The water of thermal springs is sometimes possessed of remarkable electric properties, as appears from recent observations of M.M. Thury and Hiridit, Milan, Switzerland. They inserted two platinum electrodes (connected with a galvanometer), one in a thermal spring, the other in the River Lizzone, and a continuous deflection of 74° was obtained. Later, when the electrode in the spring got covered with bubbles, the needle went back to 60°; but it returned to 74° again when the bubbles were removed. The thermal water was shown to be positively elec-

NOTICE IS HEREBY GIVEN THAT

[illegible]

EDWARDS & SANFORD.

CHARLES D. PALMER,
CHARLES H. DELANO,
EDWARD H. KNIGHT,

Committee of Inspection.

CURRENT TOPICS AT THE CAPITAL.

THE DUPLEX TELEGRAPH CONTROVERSY.

WASHINGTON, April 16, 1870.

The Edison quadruplex telegraph controversy has assumed a new phase. Mr. Edison originally assigned his interest in his invention to George Prescott and a formal application was made for a patent. Mr. Prescott having his interest in the patent, handed the Automatic Telegraph Company claimed the whole [illegible] Mr. Edison had brought into contact with Mr. Edison. An application was made to the Secretary of the Interior to have the patent withheld from the duchess of the Commissioner of Patents, and to make Mr. Edison the sole patentee. The appeal was made by Mr. Edison's assignee, who also claims to be [illegible] Mr. Edison. He [illegible] Mr. Edison's assignee, Mr. Prescott, [illegible] Mr. Edison's assignee, Mr. Prescott, [illegible] Mr. Edison's assignee, Mr. Prescott,

ATE FOR CLASSIFICATION.

TO THE STOCKHOLDERS OF the ATLANTIC AND PACIFIC TEL. COMPANY: You are hereby informed that AL TITLE" has yet been acquired to any merican Rapid System of Automatic ... now in constant use on the principal routes of OMPANY."

nglo-American Rapid System of Automatic y" has been endorsed by the "BRITISH SO- Y TELEGRAPH ENGINEERS," in "Lon- roducing such "STARTLING RESULTS" nefits to the commerce of the country will be US. GEORGE LITTLE, C. E., Passaic City, New Jersey.

1875.

ON WANTED FOR A PROF.

COTTON GUNPOWDER.

UNDER the above name on Wednesday last another member was added to the steadily increasing family of violently disruptive compounds. This explosive is of the gun-cotton class, although it differs greatly from gun-cotton proper, both in appearance and character, inasmuch as it is a fine powder of pale yellow colour, and, it is stated, can be exploded with a cap direct after having been saturated with 20 per cent. of water. It is in fact a perfected development of what was three years since brought before the public as Punshon's gun-cotton, which consisted of gun-cotton toned down with sugar, and possibly some other ingredient until it could be—and was in our presence—used in a rifle. But the cotton gunpowder of to-day could not be used in a rifle without bursting it, so local and so powerful is its action; neither is it at present intended to be so used, the company who are now manufacturing it confining their production to a material for blasting only, which they make in two strengths, Nos. 2 and 3, No. 2 being the stronger and adapted for hard ground in mining, and No. 3 for slate and other similar workings. This powder is now manufactured on a commercial scale at Oare, near Faversham, where a large number of military and naval officers, scientific and mining gentlemen assembled last Wednesday to inspect the process of manufacture, and to witness some experiments to test its power and safety.

The first point—the manufacture—proved very interesting, as it showed how that from a mere laboratory experiment, the cotton gunpowder had passed through many phases until it had become capable of production in commercial quantities. The initial process as shown to the visitors on Wednesday consists in mixing together nitric and sulphuric acid, in which the cotton is steeped, 1 lb. at a time, after having been hand-picked and further cleaned by being passed through a scutching machine, and afterwards washed and dried. After remaining in the acid for about four minutes, the cotton is withdrawn, and the surplus acid squeezed from it under hydraulic pressure. It is said to bring with it 20 lb. of acid from the tank, 12 lb. of which are pressed out, the remaining 8 lb. being abstracted from it in a centrifugal machine, in which 6 lb. form a charge. From the centrifugal machine the cotton is sent alternately to two steeping tanks and centrifugal machines, and after the second washing and drying it is passed through a pair of coarsely set rolls, and subsequently through a pair set more finely. The fibres have now become finely divided into particles of gun-cotton, and in this condition are subjected to a lengthened washing in a tank of aërated water, the air being forced through the mass of liquid pulp by a fan blast. From the aërating washer the gun-cotton—for such it now is—is run into settling tanks and afterwards partially dried, when it is taken to an incorporating mill, consisting of a pan and pair of edge runners, in which it is triturated in company with one or two other chemical substances, which complete the combination termed cotton gunpowder. It now only has to be dried, and this is effected in wire gauze-bottomed trays placed over a channel through which a current of warm air is driven. From the drying house the powder is taken to the cartridge-filling sheds, and is made into cartridges, which are packed in cases and conveyed to the magazine. The magazine is situated some distance from the works, and is zinc-roofed and surrounded by a broad moat; zinc was preferred for the roof under the belief that if an explosion were to occur, the zinc would volatilise instead of being blown about in fragments.

The second point—the experimental trials—proved no less interesting than the first, inasmuch as it showed how that from a comparatively unsafe and unreliable explosive compound—as the gun-cotton was when we first saw it some three years since—it had become an apparently safe and reliable blasting agent of great power. And this, we should here mention, is due to the pertinacity with which Mr. Mackie, the engineer of the company and manager of the works, and M. Faure, their chemist, have stuck to the task of developing the invention into its present practical shape. Not less credit is due to Mr. Trench, who has had the practical carrying out of the works under the above gentlemen. The first series of experiments were intended to illustrate the safety in transport and storage of the cotton gunpowder, and included the lighting of cartridges by ordinary means, when they simply burned quietly away, and the ignition of others by a capped fuse, when they exploded violently. Some cartridges were then capped with dynamite detonators which previously had failed to explode the cotton powder, which, as a rule, requires a more powerful detonator of special make. Wednesday, however, being a show day, the dynamite detonators, possibly not wishing to be outdone by their special brethren, in each case exploded the new powder, a point, however, which is of no great consequence either one way or the other. In order to show that explosion would not follow upon conflagration, two barrels of the new powder were placed each in a roaring bonfire, and after a time the barrels were burned through and the contents blazed harmlessly away. An iron pile driver weighing half a ton was then allowed to fall 15 ft. on to a box containing 10 lb. of the powder in order to illustrate immunity from danger in such cases as railway collisions, which, so far, it did, as the box was smashed and the powder scattered around.

The second series of experiments illustrated the strength of the powder, and consisted first in placing a charge of 2 oz. in a bore hole made in a block of Kentish rag stone measuring 5 ft. by 3 ft. by 18 in., the explosion of the charge cracking the stone in all directions. Four steel ingots weighing 8 cwt. each were next laid in a pile with 2 lb. of the powder placed centrally between them. The explosion of the charge broke the ingots up and hurled the pieces to long distances. Other four ingots weighing 11 cwt. each were similarly treated with 2½ lb. of the powder with similar results. A cylinder of cast iron 2 ft. in diameter and 18 in. deep was charged in a central bore hole with 6 oz. of cotton gunpowder and fired, but the explosion only blew the hole through, driving a conical shaped piece out of the bottom. A 6 ft. length of 70-lb. steel rail was then laid on its side on bearings 4 ft. 6 in. apart, and in its groove ½ lb. of the powder was placed and tamped with clay. The explosion broke the rail into four pieces, throwing the two ends far apart. In military work the first illustration given was the cutting off a post of 12 in. by 12 in. timber—assumed to be a stockade post—with 2 lb. of the powder placed against its side. The application of the compound to land mines was shown by placing two boxes each containing 30 lb. of the powder in holes in the foreshore of the Swale—which flows by the company's works—covering them with 6 in. of sods and exploding them. The result in each case was the formation of a crater 22 ft. in diameter and 8 ft. deep, besides the demolition of some of the factory windows, a result, we need hardly say, which was more unexpected than the other. To illustrate the statement that the powder could be exploded even when saturated with 20 per cent. of moisture, a box of the powder stated to be so saturated was placed on the beach and successfully exploded. The concluding experiment was the explosion of 50 lb. of cotton gunpowder suspended in the Swale in a case 10 ft. below water level. The explosion threw up a fine column of water some 200 ft. into the air, much to the satisfaction of the visitors, a satisfaction, however, not inferior to that afforded by the previous experiments, which demonstrated that a safe, handy, and powerful explosive was ready to be placed on the market. It has yet to undergo the test of time and experience in practical use, but from what we saw and heard of it on Wednesday there appears little reason to question its survival in these respects.

The experiments were followed by a luncheon, at which the chair was taken by Major L'Amy, the chairman of the company. The visitors included Lord Kerr, Admiral Elliot, Lieutenant Lamb, Captain Harvey, R.N., Captain McEvoy, Mr. Dunlop, C.B., the representatives of several foreign Governments, the Mayor of Faversham, &c.

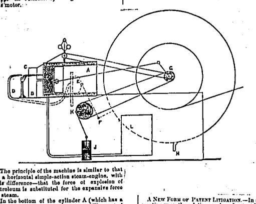
Feb 5 1870 Engineering

19

NEW PETROLEUM MOTOR.

THERE has recently been constructed at Vienna a petroleum motor for small industries. Its first application to sewing machines is said to have given such good results as to call forth a large number of orders.

The annexed cut (which we copy from the *Revue de l'Industrie*) will give some idea of this motor.



The principle of the machine is similar to that of a horizontal simple-action steam-engine, with this difference—that the force of explosion of petroleum is substituted for the expansive force of steam.

In the bottom of the cylinder A (which has a double envelope) are three valves. The central one, furnished with a very fine sleve, brings into the cylinder the petroleum from a special receiver B. The left one admits at the proper moment, the flame C, which is forced, in intermittent fashion, against the orifice by pressure of air.

The petroleum, introduced in a state of extreme division, can thus be inflamed; an explosion ensues, the effect of which is to close the two valves and drive the piston forward. The piston has a hinge joint, by which oscillates a rod connected directly with a crank. The shaft carries, on one side, a transmitting pulley; on the other, a flywheel. A tappet H acts on a bent lever F, which produces at each revolution of the flywheel, pressure on a caoutchouc bellows E. The air inclosed in the latter is carried by a tube D to the flame of gas or petroleum C, which is elongated for an instant, like that of a blowpipe, and causes the explosion.

The petroleum is introduced into the cylinder simply by atmospheric pressure, and in consequence of the vacuum which the piston makes in advancing. The impulsion of the flywheel brings the piston back again. The air is constantly renewed in the bellows E by a tube K.

To cool the cylinder, a current of cold water is made to circulate between the envelopes; being pumped from the receiver L by the pump J.

Above the cylinder is fitted a governor which regulates the supply of petroleum, by a combination of levers. The smoke produced by combustion of the petroleum escapes by the orifice of the third valve, and goes off by a chimney. The movement of the valve is determined by an eccentric on the shaft.

The whole machine rests on a metal plate fixed on a stand of wood or masonry. All that is necessary to set it going is to open a cock and to light the lamp C.

The petroleum motor is constructed with forces of from 1 to 3 horse-power; for a machine of 3/4 horse-power the price is 3,500fr., including the foundation-plate and the water-pump. The expense of mounting is small.

The following advantages are alleged :—

1. Absence of all danger through ignorance or malice.
2. Inutility of legal authorisation for fitting up.
3. Instantaneous starting and stoppage.
4. Little noise; very limited occupation of room.
5. Slight expense.

A NEW FORM OF PATENT LITIGATION.—In a recent article, commenting upon the relative number of patent litigations in England, where they grant a patent to every applicant, without official examination, and in this country, where we reject over five thousand applicants for patents yearly, and employ a standing force of five hundred officials to examine or assist the examiners, we showed that in England, out of thirty thousand law cases yearly, only eight were patent litigations. We further intimated that a very large amount of patent litigation, of a character wholly unknown in England, was carried on here, and was a necessary adjunct to our present system. We allude to the litigations before the Patent-office, such as re-examinations, appeals to the Board of Examiners, interferences, appeals to the commissioner in person, appeals from the commissioner to the district court, &c. A new wrinkle in this sort of litigation, and a new direction for appeals, has lately appeared, which seems to indicate that the time has come when Congress should, by the adoption of wise legislation, put an end to this whole business of Patent office quarrelling. Among other duties of the Secretary of the Interior, he is required to sign all patents after they are prepared, passed, and approved by the Commissioner of Patents. On a recent occasion, when the commissioner, after a long and full argument of the matter before him, had decided the case of Prescott v. Edison, in favour of Prescott, ordering a patent to issue in the joint names, the defendant applied to the Secretary of the Interior and petitioned him not to sign or issue the patent. The subject of controversy was a telegraph apparatus. The secretary granted the request, and decided to hear the argument. This was on the 20th of March, 1875, and no decision has been as yet reached. Meantime the contending parties have marshalled their legal forces before the secretary, consisting of six of our most able and expensive lawyers, have argued and re-argued, and have filed scores of pages of printed fol-de-rol upon the subject, for the secretary's consideration. If one dissatisfied applicant may thus occupy the secretary's time, all applicants ought to have the same privilege. If the secretary may nullify one legitimate decision of the Commissioner of Patents, he may nullify all. The money costs of this one litigation before the commissioner and the secretary are stated to have reached, at the present time, over fifty thousand dollars. Jay Gould, it is said, is an interested party on the one side, and the Western Union Telegraph Company on the other. Jay is doing all he can to injure the Western Union Company by running down its stock and inflating the stock of a rival company, of which he owns the control. This case is a little more prominent and has been more expensive than many that are litigated at the Patent-office. But it is notorious that a very large proportion of the time of the Patent-office officials is devoted, in one way or another, to these litigations, which, in the aggregate, involve great expense, but would become obsolete, as they are in England, if we were to adopt the English system of permitting the applicant to make his own examination if he so desires, but confining the duty of the Patent-office to the prompt issue of a patent to every applicant whose papers are presented in proper form. It is alleged by the advocates of the American system that, if our official examinations and Patent-office wrangles were abolished, then the courts would be overwhelmed with patent litigations. But the experience of other nations shows that no such result would ensue. In England, as before stated, they have only eight patent litigations before the courts per annum; while in France, Belgium, and other countries, where no official examination and no Patent-office litigations take place, the number of patent cases brought before the courts is very small.—*Scientific American.*

The Heliograph of Mr. Mance.*

BY C. BECKER.

Through the general introduction of Electric Telegraphy, and the all but universal adoption of the Morse alphabet, it occurred to Mr. Mance—who has the advantage of a thorough knowledge of both, and the privilege, if it can be called one, of a long residence in a country with plenty of sunshine—to develop and improve the existing appliances into a system. His aim has been to produce an instrument which is very compact, very portable, easily set up, and easily worked. Although he was first in favor of larger instruments (which are still preferable for permanent stations), he is now convinced that an instrument of the size here shown is all that is requisite. The chief objection to the adoption of the sun-telegraph is, that we cannot command the sun to shine in the same manner that we can control a galvanic battery; and it must be understood that Mr. Mance advocates his system only as an auxiliary to other systems of field telegraphy. It would come into operation at distances when other methods are useless or tediously slow, and it compares favorably with existing systems of signaling in cheapness, range, rapidity of communication, and, last, in portability. The flashes are invisible to any one placed far to the right or left of the direct line, so that, from elevated points, far distant communications could be kept up with a fortress without the besiegers having any suspicion of the fact.

It would be superfluous to give instances, when within the last few years the use of these instruments might have brought about the most important results.

The instrument consists of a light, but firm, tripod-stand, similar to those used for prismatic compasses. On the top a plate is moved by a tangent screw which admits of quick and slow motion, and the plate carries on a pin a semicircular ring, which again carries on pivots the round mirror, the silvering of which is removed in the center for the space of a circle about 3-16th inch diameter. To the plate is also attached a simple key, which is pressed down and springs back like an ordinary Morse key. This key is connected with the top rim of the mirror by a steel rod, which can be lengthened and shortened—as occasion may require—by turning the handle and screwing the rod through the small brass ball which secures it to the edge of the mirror.

By means of the last-named adjustment and the tangent-screw the glass can be altered, as the ever-changing position of the sun may require.

From 12 to 15 yards in front of the instrument is placed a sighting-rod. This rod is to mark a spot exactly in a line with the center of the heliograph and the distant station. A metal stud marks the spot, and a wooden cross-piece marks where the flash rests when not directed on the opposite station.

The instrument can be set up ready for working in a few minutes. When the exact position of the distant station is not known, a flash of sunlight must be thrown in the direction of the most likely points, and this must be continued till it is answered by a flash, which indicates that a distant signaling party is on the look-out. Then, after releasing the tangent-screw, the glass must be turned to a convenient angle, and the sightingstick must be directed in a line with the distant station by looking through the small aperture in the center of the mirror. When this is effected, the stud must be raised or lowered till it is in the line of vision on a level with the center of the glass and the distant flash, and the short cross-piece must be placed at right angles to the upright, about a foot below the stud. After being thus adjusted the instrument must not be moved.

The spot will be observed gradually to rise or fall, according to the direction in which the sun is apparently moving. The handle of the key, or the tangent screw, or both, as the case may be, must be turned slightly after every two or three words, to insure, as far as possible, that the center of the spot shall be on the stud when the key is pressed down.

When the sun is rather low in the heavens, and behind the signaller, it becomes more difficult to direct the flash with accuracy. In consequence of the obtuseness of the angle the spot loses its circular form, and becomes rather dim when reflected on the stick. If it is required to work frequently with the sun in this position, the employment of a second glass on a light tripod stand is recommended.

But it would be useless here to enter more into the minutiæ of working the instrument: suffice it to say that, in experienced hands, twelve words and more per minute have been obtained, while others state that men—after a fortnight's practice—could attain only from four to five words per minute. As to the distance, 10 and 20 miles—and in very clear weather 40 miles—have been obtained.

A number of officers of the Indian Army have tried and reported upon the instrument, and—with the exception of one—all report most favorably of the system as an auxiliary to existing systems, and efforts are being made at the present moment to insure their adoption for the Indian Service by the authorities.

*Read before the Society of Telegraph Engineers.

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Sir William Thomson's Tide-Calculating Machine.—At the ordinary meeting of the Royal Society of Edinburgh held on Monday night, Sir William Thomson, President of the Society, showed and described a tide-calculating machine, the object of which was to utilise and apply the method of the harmonic analysis, which had occupied the attention of a Committee of the British Association for several years, to the prediction of tides, according to the results of the most complete analysis that could be applied to observations previously made at any port by the tide gauge. The tide calculator was obtained by a most perfect arrangement of a series of ten pulleys, each of which had an up and down motion, while the centre of each had a circular motion. These gave the mean lunar tide and the mean solar tide, with their respective inequalities. The up and down part of the circular motion alternately pulled up and let go a chain, one end of which was attached to an ink bottle moving in a geometrical slide, and recording the combined results in curves upon a revolving diagram. The two special points in the instrument were the principle of combination which it exhibited, and the geometrical slide for marking. The result gave much more complete information as to future tides at different places than had been hitherto obtained. Formerly the times and heights of high water alone were given, but the tide-calculating machine gave the height of the water at every moment of the 24 hours for the whole year. The tide curves could either be used directly by the harbour-master or sailor, or if it was thought more convenient a table of numbers could be taken with great ease from the curves and printed for general use. In the improved tide gauge, which Sir William also showed, dynamical and geometrical principles had been introduced in such a way as to minimise the errors of the ordinary gauge in use, resulting from friction, and the imperfect rigidity of the different parts. It was also fitted to show the results in a manner more convenient for subsequent use. Under the old system fourteen or more curves were superimposed in an apparently confused manner on one sheet of paper; in the improved tide gauge one curve alone was drawn on a long slip of paper for the whole year or for any other given time. Instead of the scale being as formerly, 12 in. or 24 in. to the 24 hours, he had reduced it to 1 in. for the 24 hours, and thus on a piece of paper of a convenient length the improved gauge could show a simple curve for a whole year. That change rendered it necessary to mark time on the curve itself, and that he did by a horizontal motion of an ink bottle, which made a mark in the curve every hour. Sir William Thomson also described, with experiments, certain capillary phenomena, which had come under his observation while adjusting ships' compasses and otherwise. A vote of thanks was given to Sir William at the close for his interesting communications.

...arches of Professor Kohlrausch and O. Grotrian on the conductivity of solutions of the chlorides of alkalies ... alkaline earth metals are published in recent numbers of *Poggendorf* (cliv. pp. 1 and 215). It was necessary in their experiments to take great care in noting the temperature and preventing or allowing for any changes in temperature, since the conductivity of electrolytes is influenced by temperature in a very high degree. The source of electricity employed was an induction apparatus, called by the authors a sine-inductor. A magnetised disc is rotated in a coil of wire with such velocity as to produce from 100 to 200 currents in alternate directions in a second. The object of employing a system of currents in alternate directions is to prevent the polarisation of the electrodes. The authors have determined the conductivities of aqueous solutions of nitric acid and of the chlorides of sodium, potassium, ammonium, lithium, magnesium, barium, strontium, and calcium. Three sets of experiments were made as nearly as possible at the temperatures 0 deg., 18 deg., and 40 deg. The conductivity of each substance was investigated at each of these temperatures, the strength of the solutions varying from 5 per cent. of the anhydrous salt up to complete saturation. For a given percentage strength of the solution, it was found that the conductivity increased very rapidly with the temperature, the rate of increase being not quite uniform, but much more nearly so than might have been expected. For instance, the conductivity of potassium chloride (5 per cent. of salt) which is 421 at 0 deg., becomes 931 at 40 deg. This increase is immensely great as compared with that of the electric resistance of a metal or the pressure of a gas. When the temperature remains constant, the conductivities increase continuously with the percentage strength of the solution. The chlorides of calcium and magnesium, however, are exceptions to this rule, the solution of $CaCl_2$ having a maximum conducting power when it contains 34 per cent. of salt, and that of $MgCl_2$ similarly when it contains 24 per cent. Nitric acid of maximum conducting power has a 1?? per cent. specific gravity 1·1945 (at 17 deg. C).

Engineer May 21 75

Mr. A. Holtzman, of Amsterdam, Holland, is the author of a method of laying underground telegraph lines, which is alleged, after two years of trial, to give the most satisfactory results. The Holtzman plan consists substantially in providing a cast iron trough which is filled with a peculiar bituminous insulating compound, which the inventor terms *brai liquide*. The gutter rests in the bottom of a ditch in the earth. The compound is put in while warm and semi-liquid. The telegraph wires, insulated with gutta-percha, are then submerged, separately, in the compound in the trough; the latter is then closed by a cover and the ditch filled with earth. The compound soon cools and solidifies, and holds the wires in perfect insulation, unaffected by moisture, temperature, or decay. A telegraph line of forty miles length near Amsterdam, on the above plan, has, it is said, proved an entire success. Although laid in bad swampy soil, no breaks have occurred. It is alleged that this method of laying wires is economical.

ENGINEER May 21 1875

GRINDING LENSES.

[7236.]—I beg to inform Mr. Wenham that the correct weight of the crown disc was about 2·5; not less than that; as stated by me in my former letter, the rough surface of the disc, by retaining air bubbles, having led me into the error.

"W. L.'s" letter (7233), giving his plan of grinding concave glasses, is very obvious, very simple, and most likely the reason of his failures (see 17717). He does not grind cups; his plan produces basins, or rather bells. To render both curves of a double concave directly opposite is not difficult; one good plan being to chuck the half-finished glass in a carefully turned recess of the same diameter as the lens, and cement it there, being careful to see that the rim is well home, and the thing a good fit; but when all this is gone through, how about the marginal errors, which "W. L." ignores altogether, and for which no plan succeeds with me but that given in 7185?

I am, however, an amateur, and have only steel to work with, and fail to reduce finished doubles of larger size, as an accomplished hand like Mr. Wenham, with diamonds, can no doubt easily do.

Having no diamonds, I get an old small three-cornered file of Stubb's manufacture; heat it cherry red, and plunge in mercury; with this, ground to a diamond point, anything in glass or steel can be turned; it must not be brought back.

I have now to afford fellow amateurs such small information as some weeks of constant lens-grinding has given to me.

With Chance's heavy flint, specific gravity, 4·05; refraction 1·64; and dispersion ·059; and his crown 2·50; refraction 1·52; dispersion ·04—I have constructed a reasonably good one-eighth to these curves, viz.:—The front—1in. diameter of template (crown); the back ·45 (crown). The middle triplet: —Front curve ·175 diameter of template (crown); flint surface ·175, ditto, (flint); back flint ·32, ditto, (flint); crown ·32, ditto, (crown); back crown curve ·35, ditto, (crown).

This glass is defective, as being too near the object, and the secondary spectrum is somewhat more than one accustomed to Powell's lenses considers agreeable. It is nevertheless very fair, and will be very useful.

Will Mr. Oldfield kindly give all the curves of his tenth for comparison, as I fail to considers the above curves consistent with Potter, and feel certain a book on Optics is yet to be written?

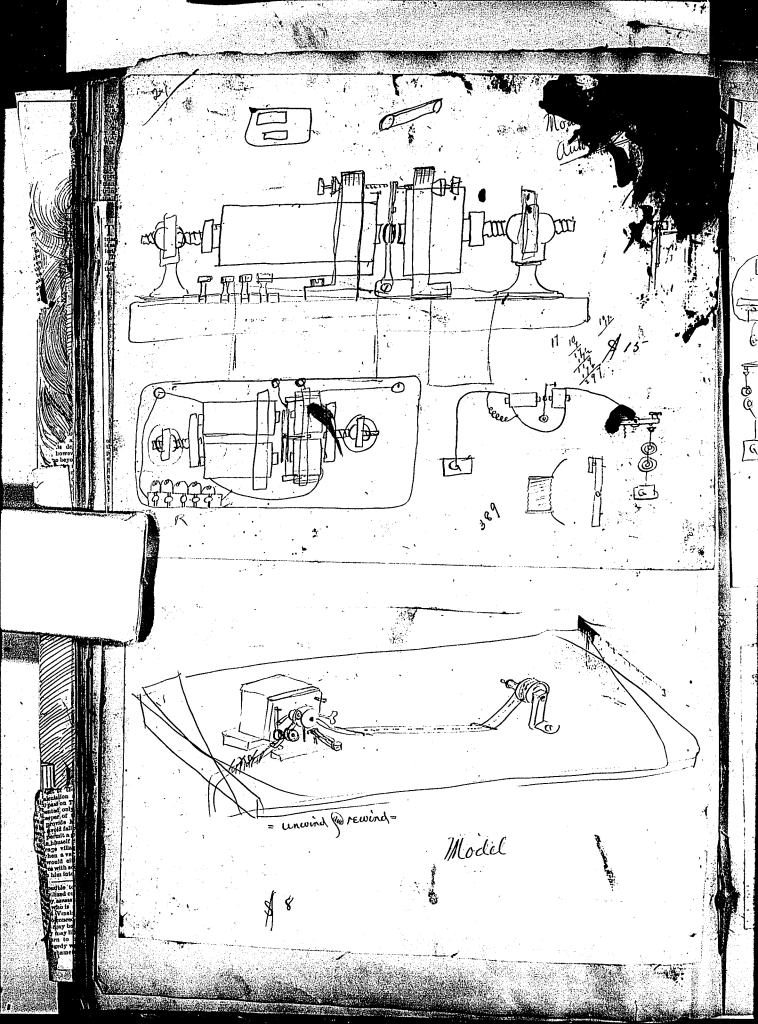
I cannot see any reason why a doublet might not do for the middle, the flint of which would take the meniscus form; nay, a single flint might be effective, and by-and-by I shall try these. But I would fain now attack the other invention of Mr. Wenham's, viz., the double front, but hesitate without some more assistance than his paper in the March (1869) number of the Journal gives.

All microscopists and amateur workers owe a deep debt of gratitude to Mr. Wenham, who greatly enhances the value of his communications by the frankness with which he deals with ignorant and blundering workmen like myself.

With Mr. W.'s diagrams before me, and some experience in glass polishing, I had to grind and polish more than thirty surfaces before the above figures were arrived at; in fact they were got by a laborious tentative process, and for the benefit of less persevering friends I beg to inform them that I have arranged before me a row of little failures, some with neat little holes through their centres. I have also to add that although I have a small jigger-lathe, I use a foot lathe of 2½in. centres, with a long mandril in preference, and can work the smallest bit of glass readily on it.

I hesitate to trouble Mr. Wenham with further queries, but I should like to know how to reduce the angular aperture of an objective, if there be any rule for placing the two back glasses the correct distance apart, and if he would give me his opinion of a doublet instead of the triplet in the middle; and finally, if he would suggest some approximate curves for a one-eighth or one-quarter on the double-front idea, to smooth the path towards the attainment ultimately of an objective of 200th of an inch.

The Ghost.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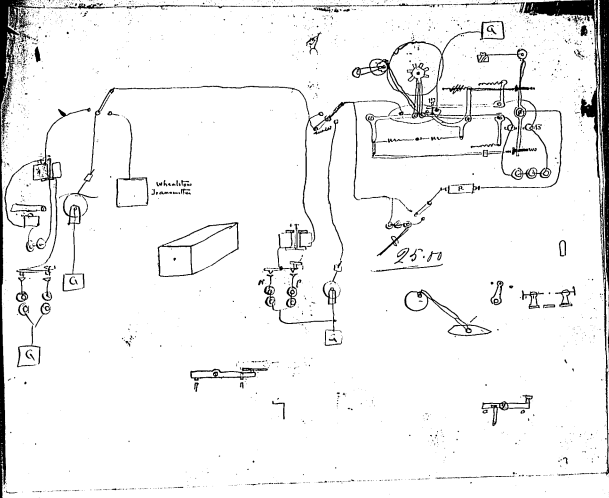
rewind =
Model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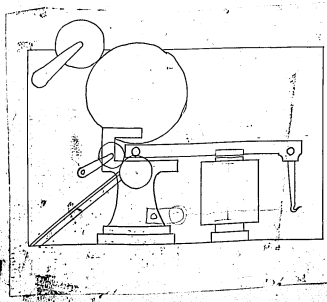
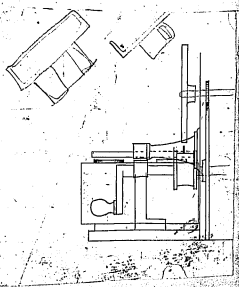
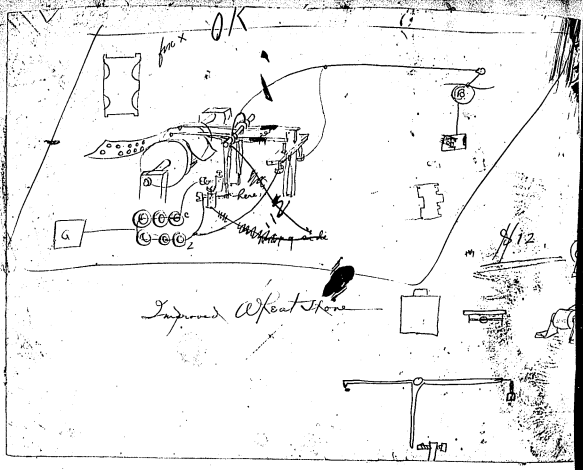




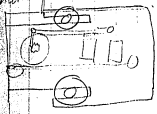

Improved Weatherstrip

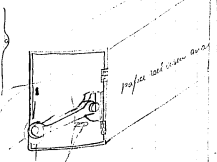
Daily Report of Tests of Southern Wires made at New York, on 187

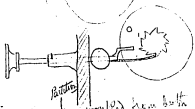
DESCRIPTION OF WIRE. Number.	Ending at	Number of Relays in the Circuit.	Station Tested with	Length of Wire Tested (in Miles).	WEATHER.	THERMOMETER.	Resistance of Conductor (in Ohms).	Resistance of Insulation (in Ohms).	Mileage Resistance of Conductor (in Ohms).	Mileage Resistance of Insulation (in Ohms).	REMARKS AS TO THE WEATHER.—If rainy, state whether the rain extended over all portions of the Circuit; and, if fair, whether it was fair throughout the Circuit.
1.	Washington,										
2.	Philadelphia,										
3.	"										
4.	Washington,										
5.	"										
7.	Philadelphia,										
8.	"										
10.	"										
11.	Washington,										
16.	"										
17.	"										
18.	"										
22.	"										
26.	"										
27.	"										
28.	Philadelphia,										
29.	"										
30.	Harrisburg,										
31.	Philadelphia,										
33.	"										
34.	"										
38.	Scranton,										
41.	Washington,										
42.	"										
43.	Baltimore,										
44.	Philadelphia,										
45.	"										
46.	"										
47.	"										

Main frame would be better but more way

Sep 24 1875
Barthelet





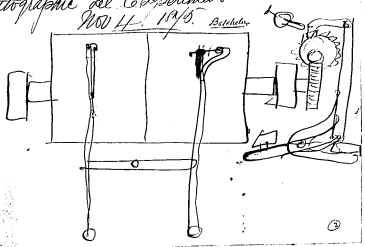


Slot to be cut in piece X
of paper hole & prevent
the paper coming off
which Bent as I did in
one square inch &
prevent Bindweed button
screwdriver & Cork &
chisel

Corrosion can be worked from both ends

① LAPIDIFIA BIENNE IMPRIMERIE

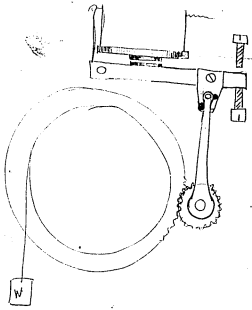
Autographie des Expériences
Nov 4. 1875. Barthelet



③

25

23

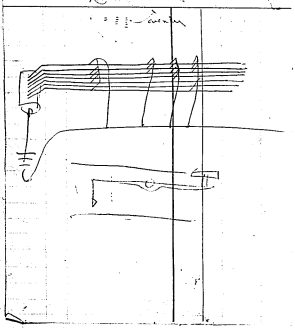


No 2

SWARMENT.

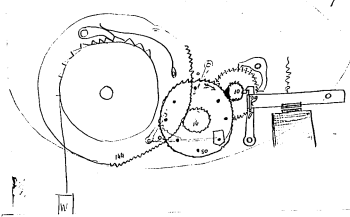
Newark, N. J., 187

To EDISON & MURRAY,
MANUFACTURERS OF
Telegraph Instruments,
10 & 12 Ward Street.



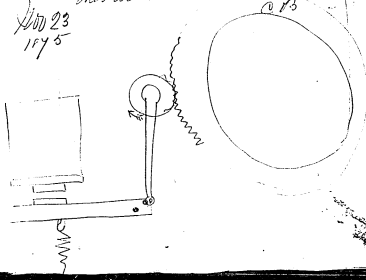
Gang shifter No. 1, Nov 23 1875

This was drawn about Aug 20th



This was drawn about Aug 20th

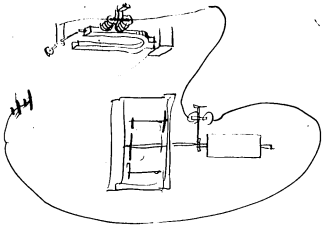
Nov 23 1875

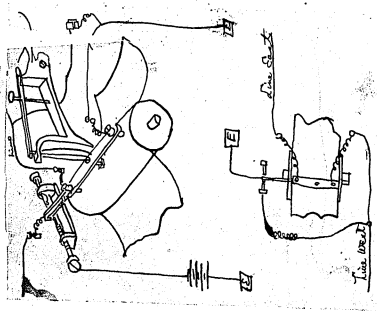


23

Paines Electric Engine

About a year ago Mr Henry M Paine startled the Scientific World by announcing through the Colums of several journal the discovery of a powerful Electromagnetic Engine whose power exceeded that of Steam,

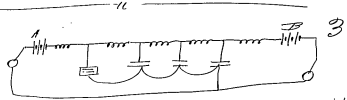




Try this. Cable experiments 1901

Try this. 2

11



10 Cells each. Turn a given speed reader, then disconnect A + add to B + make 20 Cells in B note difference. + Condensers

(1)

Newark, N. J., 187

Mr

Bought of EDISON & MURRAY,

MANUFACTURERS OF

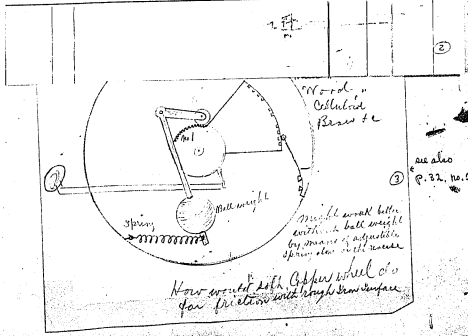
Mirror Galvanometers, Resistance Coils, Condensers, Submarine Keys.

Induction Coils, Differential Galvanometers, Electrometers, Siemen's Ink Recorders.

Marine Galvanometers, Secondary Batteries, Polarized Relays, Morse Registers.

~~Morse Keys~~, ~~Morse Sounders~~, ~~Printing Telegraph~~ App., Learners Recording Insts.

10 & 12 Ward Street, Newark, N. J.

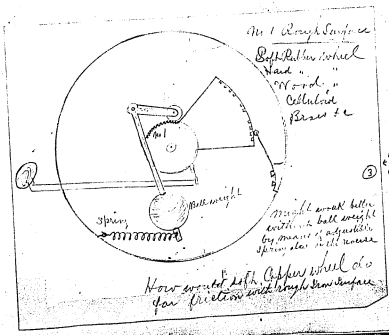


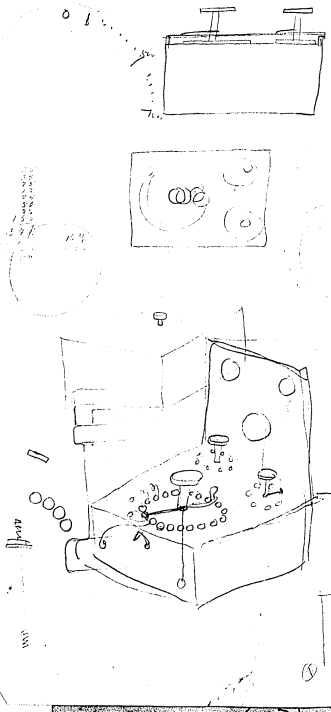
see also P. 32, no. 2.

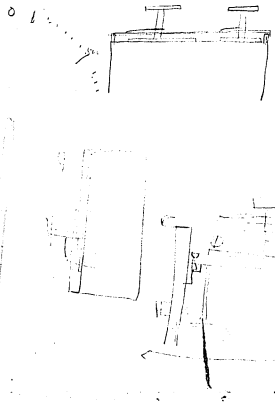
Try this Cable experiment

2.

3


No 1 Rough Surface
Soft Rubber wheel
Hard " "
Wood "
Celluloid
Brass &c
see also p. 32, no. 2.
Spring
Ball weight
No 1
Ball weight with a ball weight by means of adjustable spring acting on the lever
How to get both Copper wheel &c for friction with rough surfaces

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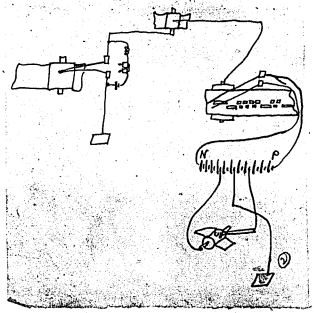
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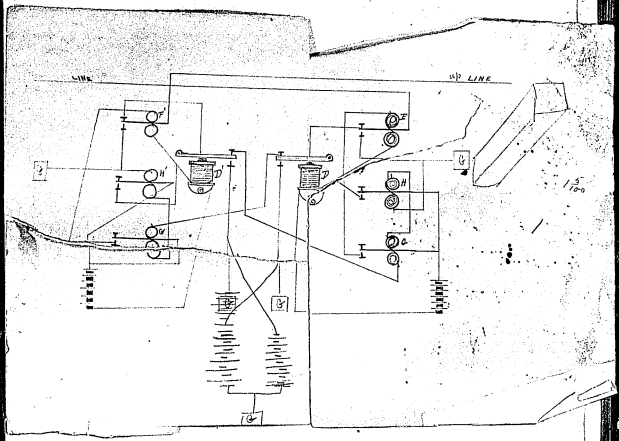
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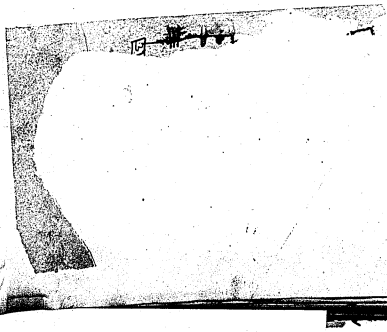
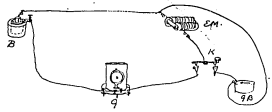
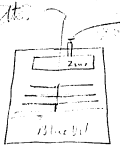


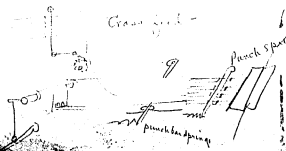
Experiment No 2. Feby 21. 1874. 91



B is a single Daniel cell, G a mirror Galvanometa wot K a Key with double contact points EM is the long Electromagnet, GB a Bradley Galv on No 1 Coil, press key down & wait for 5 or 10 seconds then open & close as quick as possible, (very quick) If the Mirror Dont move perceptably, and GB Does Then Smash goes Modern theories, The magnet must be quite long and lots of fine wire on it otherwise you will not be able to work the key quick enough to prevent the Mirror working, The armature on EM should be permanently attached, so as to increase the inductive Effect — ①



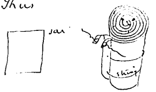
Carnot or Foucault



(1) ~~B Batty~~ Book 17 feb

14 Feb. 1874

Batch make a secondary battery of one of the large Blue vitrol battery jars and sheet Copper thus

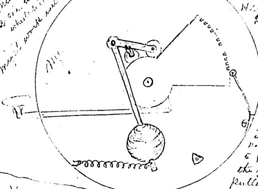


These paralell sheets of Copper are nearly as high as the jar about 1½ inch from edge They are coiled together about ¼ inch apart and may be seperated with sticks of wood every 3 inches and then securely bound together with stout marlin so that the two plates Cannot possibly touch Even with rough handling, I wish to ascertain the amount of charge & discharge this will show on a Bridge as well as the length of discharge. if satisfactory J. C. Reiff authorizes me to make $50 worth which will be a dozen ~~probably~~ to be sent (1)

continued p. 36.

No 2 Smooth Surface Steel Magnetized wheel Soft Rubber Hard do Brass Copper Wood Celluloid &c

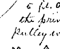
might have two or more wheels to increase friction might work well with spring alone or weight



see also p. 28 no. 3

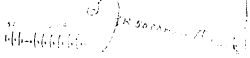
Steel Magnetized wheel might have a groove in surface & corresponding one in gravity indicator to fit. On the same, on the principle of a Pulley wheel & Rope

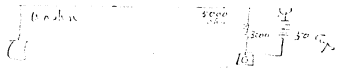
How would soft Copper wheel do for friction in rough or smooth groove in gravity indicator

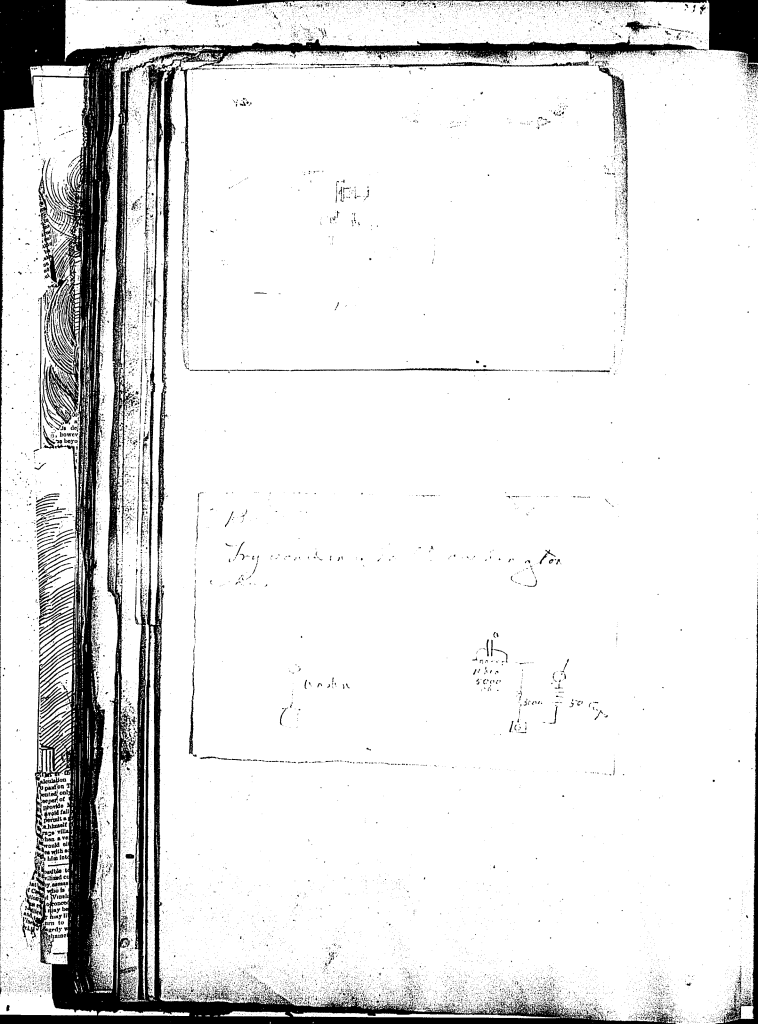


Other wheels might be made the same to try (2)

Chemistry





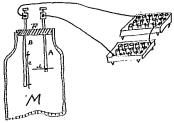


Book it.

Vol. 92 18/4

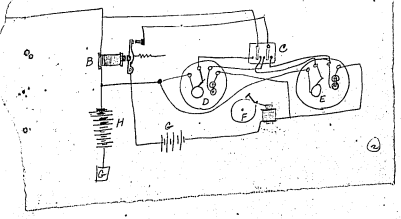
Experiment 101.

To determine whether any electricity passes from one pole of a battery of 100 elements to the other when seperated a slight distance,



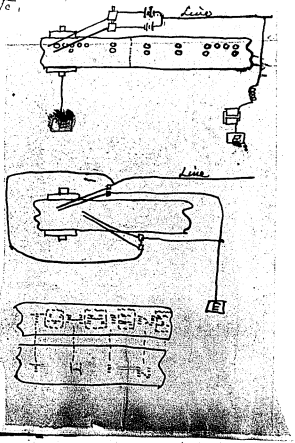
M is a clean dry candy jar T is a tight fitting shellac with or Hard rubber top. well secured on the jar with plenty of beeswax so that not the slightest trace or air can get within or out. A B are two brass rods B has two metallic projecting pins on which is secured a strip of chemical paper two inches long moistened with a solution of Iodide of potassium. And Starch.

1 grain starch 2 oz distilled water 1/4 oz Iodide potassium.) A is another rod having a platina wire d facing the Iodized slip c. coming within Exactly 1/20 of an inch from it - These two rods project out of the



Type 2 Expmt No 1

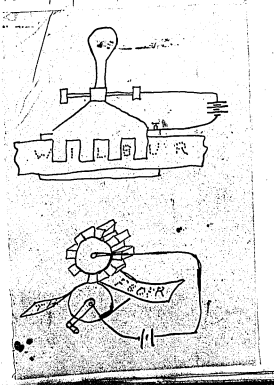
Cover and end on Bending pools. These rods should be as fine a point as possible, they are Connected with 3 Trays of the last Battery and placed on a table, The Tint of any should be noticed and timed as well as the time taken the battery is first connected The first Tint should be noted and the time taken when it shall have assumed a depth Equal to the first Tint on the Chromatic Scale shown in Part work on Ozone should there be a Tint it will prove first. That the particles of air are conductors for Dynamic or Voltaic Electricity of low Tension and corollary that induction is the effect of Conduction the Heating effect being only produced by polarization & encompassing EMF Secondly that Particle of Pot or any other Chemical Compound that is decomposable by Electricity in any available light for Ozone - E/E.



along the line. I expect to work for 2 of these batteries are placed on the line 300 miles apart that they will generate (from the addition of the branching battery) so much Electric Charge on the line to the line that being the Case the Static Charge of the Line will be Equally Compensated for and any speed on any Length of Circuit may be obtained — Book it =

Make a Coil of that Gutta percha wire (small) with perfect insulated joints & Coil it on a magnet (6") two Layer Relay Coil so that it will take up the same bulk as if Small spools were used want to insert it in the line. Signal a battery the current of which passes through the Gutta percha wire, also wind the outside of a Bichromate battery (2") with 5 or 6 Layer of ordinary Relay Wire - work to see if when I close the circuit of the battery there will be induction on the Wire —

Charge can maintained Secondary Battery box with the 8 batteries by Connecting the prime Conductor on one end of the field Glass machine to one end Battery & other prime Conductor to other End & turn for 5 minutes, then with with insulated Key Electric Battery on Broadly get effect produced =



The Walter Electric Burglar & Fire Alarm Co.,

MANUFACTURERS OF

WALTER'S ELECTRIC BURGLAR & FIRE ALARM,

Patented May 13 1873.

GENERAL OFFICE,
PARKER BLOCK,
UTICA, N. Y.

BROWN & ADAMS, *Agents,*
19 & 12 Ward, & 186 Market Sts.,
NEWARK, N. J.

TO THE PUBLIC.

Locks, bolts and bars, are mockeries to the fiend of the midnight thief and arsonist. He is ably aided by the agencies in search of booty, fully armed to resist arrest in case of alarm and plies his nefarious work. While thieves always be detected, as it spares neither rich nor poor, and many who fear no robber, make to find they are known to thieves, their property pained, and lives in danger. As a remedy for these evils, "The WALTER ELECTRIC BURGLAR & FIRE ALARM CO." would introduce to the public a faithful and trusty sentinel or watchman, who never tires or sleeps, but is constantly on duty sure to detail the approach of midnight thief and give timely warning of approaching danger.

The superiority of "THE WALTER ELECTRIC BURGLAR & FIRE ALARM" overall others ever invented is attested by the following facts.

1st.—It is worked upon what is known as a "Closed Circuit," thus overcoming many difficulties that have to operating all other alarms.

2d.—It requires but a single wire to connect all parts of a building with the Alarm.

3d.—The Alarm and all its connections are very simple, and when properly put up are not liable to get out of order. No soldering is necessary.

4th.—It can always be relied on, for it never fails to do its duty when required.

5th.—The low price at which it is offered brings it within reach of the poor as well as the rich.

Description of the Alarm.

The magnets, movements, &c., employed in sounding the Alarm are enclosed in a black walnut case, 8 x 12 inches, which makes a very neat ornament.

It is furnished connected with every exposed door and window in the building, is placed in the sleeping room, and operated by electricity.

Any simple opening of a button (or switch) on the Alarm, is all that is necessary to connect, or disconnect, any door, window or door in any part of the building.

When set, the opening of any door or window instantly sings the bell, which continues to ring until it is stopped by the person in charge, and during which time no effect on the Alarm by opening other. It is set in motion. Should a fire break out the same alarm will be given.

A small pointer put indicated instantly by its position the door or window as left open or put out of use it is to be closed.

The windows can be left open for ventilation, and if moved either way or down the bell instantly commences to ring, and at the same time if the windows are closed, raising them an inch will cause the Alarm to sound.

When set it is impossible to remove a sash without ringing the bell.

When closed a clock can be attached to it, which separates the Alarm from the circuit at a given hour in the morning, and prevents it from ringing when the servants retire, and also gives you a time keeper in your room.

It can be put in the same building without moving it in the least. The wires in use are not in sight, having to be sown but the Alarm, which can be placed in any part of the building desired.

Should you wish to place the Alarm in your house or at a Police Station in case of a Bank or Store, and have no communication with the sleeping room, the wire cannot be cut or tampered with, without instantly sounding the Alarm. This secures the value of a "system on city," and it is one of the chief merits of the Alarm. It gives the person in charge the ability to disobey without a sash and thus affording an opportunity to save life and property.

The Battery is perfectly clean. No poisonous vapor arise from it. Requires only ten or fifteen minutes attention once in six months.

Our floor attachment is the most perfect ever invented for the protection of safes or vaults, and when attached to the floor, it is impossible to approach near the safe without sounding the Alarm.

This Alarm is not only valuable for the protection of Banks and Business Houses, but for Private Residences, Cabs, Buildings, Barns, &c., even to both the out, and the inner doors of the

It is warranted to do as we claim, for it. We freely offer to test it to any of it does not work as represented, take it back and refund the money.

With the fire Alarm attachment absolutely safe from fire can be given.

Parties are respectfully invited to call and examine it.

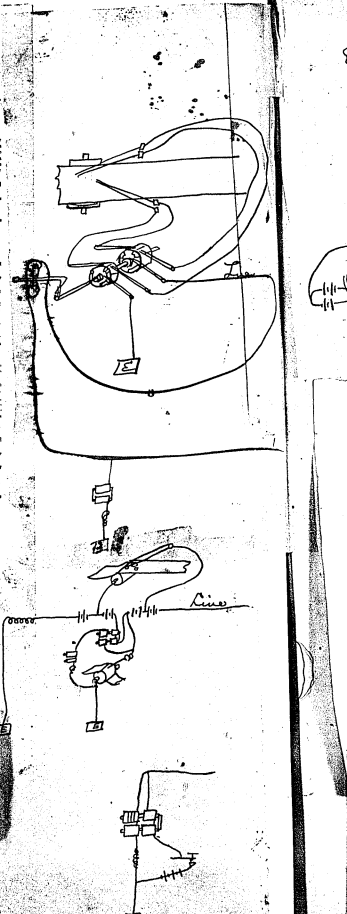
Price List, furnished on application. In ordering, state the number of doors and windows to be protected, also if entire floor protection is desired.

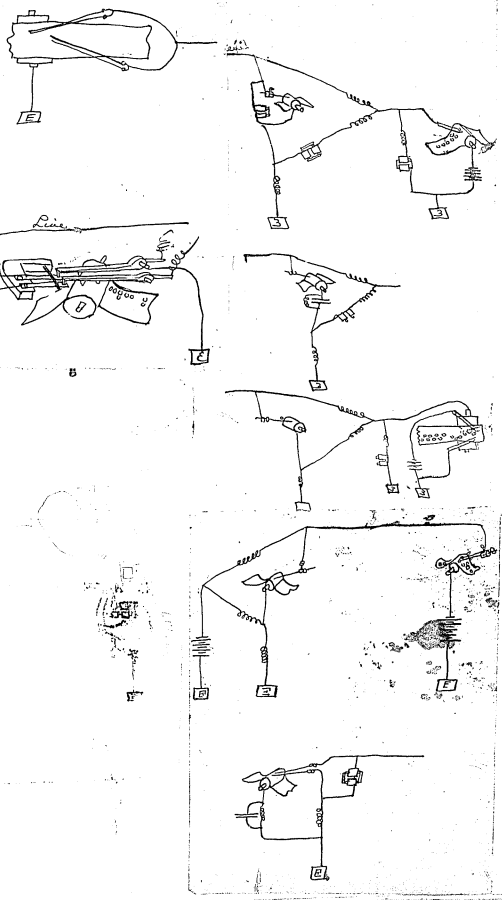
BROWN & ADAMS, 19 & 12 Ward St., & 186 Market St.

REFERENCES.

W. H. Townsend, 107 East 59th, St. New York.	C. W. Sharp, Correspondent, N. Y.
W. H. Vanderbilt, 419 Broadway,	A. L. Scott & Son, Cherry Valley, N. Y.
W. H. Rossiter, 207 Fulton St.,	H. S. Walker, & Co., Newville, N. Y.
W. H. Brown, 12 Raymon St. Brooklyn	J. J. Rossi,
A. D. Gillette, Esq.,	H. A. Smith, Richfield Springs, N. Y.
Hon. Thurlow A. Shaw, Mayor, Utica,	W. T. Bassett,
A. S. Cheshire,	J. C. Dutcher,
Edward Curtis's Sons,	N. S. Benson,
Oneida Nat. Bank,	National Bank, Potsdam, N. Y.
Hon. Wm. Kernan, Mayor, Lockport, N. Y.	First Nat. Bank, Oxford N. Y.
First Nat. Bank Carpenters, N. Y.	F. A. Gunnet, Manager W. U. Telegraph Office, Johnson, N. Y.
S. G. Bronson,	

Adams Bros., Cheap Job Print 101 Waverly Place, Newark, N. J.

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39

THIRD EDITION.

TWO O'CLOCK P. M.

JAY GOULD'S NEW SCHEME.

THE PROPOSED PERFECTION OF THE TELEGRAPH MONOPOLY—HOW THE WILY FINANCIER WILL EUCHRE THE STREET IN ANY EVENT.

The bulls and bears are much more exercised over the rumor of the consolidation of the Western Union and Atlantic and Pacific Telegraph Companies than they are over the failures of the early part of the week. The principal brokers on the "street" agreed this morning in the opinion that the consolidation had not yet been effected, but that it depended upon the option of Jay Gould, who will either sell out his stock to the Western Union Company or run the price up higher, sell on the "street," and run it down again for the purpose of buying it in again and enjoying "a new deal."

At Duncan, Sherman & Co.'s banking house ex-Judge Shipman is still busy on the firm's exhibit and does not expect to finish it for several days. He keeps the employes of the firm at work until late hours in the evening, remaining on duty himself, but the liabilities of the firm are scattered over the world so generally that the work is necessarily slow.

Mr. John Baird, the receiver appointed to control the affairs of the suspended Commercial Warehouse Company in the interest of the creditors, this morning continued the duties upon which he entered last evening. The brig load of sugar which arrived from Cuba yesterday consigned to the company was placed in his charge for immediate sale.

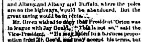
Vice-President Green, of the Western Union Telegraph Company, said this morning that no consolidation between that company and the Atlantic and Pacific had been made, although a proposition of the kind may have been made to the Western Union Company by parties who felt competent to carry it through. In his opinion the Atlantic and Pacific Company had been fighting the Western Union desperately, not for the purpose of benefiting itself, but solely in the hope of being bought up by the Western Union. The latter company has three forces in opposition—the Atlantic and Pacific, the Franklin, and the Southern Atlantic. The Franklin does business only between Boston and Washington, and is formidable because it does its work well. The messages it carries are twenty-five cent messages, and leave but little profit, for by careful estimate the Western Union Company has found that it costs very nearly twenty-five cents to receive, transmit, and deliver a message. It would be useless to buy up the Franklin Company, because the business between the great cities to which it sends is so great that another company will surely be started. The Southern Atlantic Company is a *bona fide* competitor, but it does not interfere with the Western Union to a very great extent. It rents their lines to the north, and is in that way a source of profit. But the Atlantic and Pacific Company meets the Western Union at every turn. In the matter of rents the saving by a consolidation would be immense. In the exchanges and hotels both the companies compete for an office and are forced to pay absurdly high rents. If there was but one company the hotels would be glad to give the company an office rent free. In 1866, in the Delavan House in Albany, when the United States Telegraph Company existed, the Western Union had to pay $1,000 rent for an office, but when they bought the United States Company in, and threatened to abandon their office in the hotel, they not only got the room for nothing, but the hotel boarded their operator. So in this city an enormous rental is paid to the Fifth Avenue Hotel for an office, while if there was but one company the hotel would not do without the office if they got nothing for it. By a consolidation valuable routes now run by the smaller company could be operated at less cost than by them, and other lines, like those between the cities of New York and Albany and Albany and Buffalo, where the poles are on the highways, would be abandoned. But the great saving would be in rents.

Mr. Green wished to deny that President Orton was in league with Jay Gould. "This is not so," said the Vice-President. "He may listen to a business proposition from Mr. Gould, and may accept his terms, but only as he would from any other business man."

ELECTRO-MAGNETISM AND NEW GALVANOMETER.

[9441.]—I VENTURE to publish these experiments of mine, in the hope that they will be found to give a much better explanation of the effects of the electric current on magnetised needles and magnets, and likewise give a better explanation of the effects called magnetism. It is well known that a magnetised needle or compass, when placed directly under a conducting wire, immediately a current is passed along the conducting wire, will place itself *almost* at right angles to the conducting wire. I venture to state that it is caused by the rapid rotary motion of the electricity round the wire. I venture to think that it is this rapid rotary motion around the wire, more so than the progressive along the wire, so that the current must travel in a spiral path along the wire. It is the rotary motion around the wire which causes the effect upon the needle or upon other conducting wires.

FIG. 1. FIG. 3.



A go... needle, ... well kn... form w... tained. ... the M... Lathe. ... A s... brass ... balance... the sm... at the e... cannot ... round t...

Prices of Metals.

The same journal also contains the following interesting figures:

The first eight metals of the table are extremely rare, and are only sold in minute quantities, but at rates which would make the value of a pound as stated. It will be seen that the expression "worth its weight in gold," is by no means superlative.

VALUE PER POUND AVOIRDUPOIS.

Indium	$2,330 00	Silver	$18 66
Vanadium	2,320 00	Cobalt	7 78
Ruthenium	1,600 00	Cadmium	6 00
Rhodium	100 00	Bismuth	3 63
Palladium	463 00	Sodium	3 20
Uranium	378 56	Nickel	2 80
Osmium	375 20	Mercury	1 35
Iridium	337 66	Antimony	36
Gold	301 45	Tin	33
Platinum	116 20	Copper	28
Thallium	116 37	Arsenic	18
Chromium	58 00	Zinc	11
Magnesium	46 50	Lead	07
Potassium	35 00	Iron	02

(Condensed from the N. Y. Tribune.)

Atlantic and Pacific Telegraph Company.

ANNUAL REPORT OF PRESIDENT ECKERT.

The annual meeting of the Atlantic and Pacific Telegraph Company was held on April 28, at the offices of the Company at No. 198 Broadway. General Thomas T. Eckert was re-elected President.

There were constructed during the year 728 miles of wire. The lines and connections cover 11,612 miles of poles and 28,477 miles of wire, and brings them into direct communication with 1,385 offices. The number of miles of pole line in the direct control of the Atlantic and Pacific Company at the close of the year was 5,097, and of wire 12,039.

The authorized capital stock of the Company is $10,000,000. The amount issued at the end of the year 1874 was $1,578,100, leaving a balance of 1,219 shares in the treasury.

The gross receipts of the Company for the year 1874, including the Franklin from Nov. 29 to Dec. 31 inclusive, were $150,531 01; the gross expenses were $889,111 97, leaving a net profit of $51,122 01. This surplus and a portion of the Company's funds, derived from sale of its Treasury stock, were expended in the construction and purchase of lines. The Company had on hand at the close of 1874 net assets amounting to $197,113 41, in addition to its Treasury stock. This sum is available for the extension and development of the lines and business. There were also on hand at the close of the year materials and supplies sufficient for about two months use. The Company is free from debt of every kind.

Since the beginning of the year the Company has acquired working possession of the American Automatic System of Transmission, which is protected by thirty-six indisputable patents. The use of this system readily admits of instant change from ordinary Morse to automatic at the will of the operator. The Company has also purchased the exclusive right to the use of the Wheatstone Automatic System of Transmission in the United States and the Island of Cuba. This system has lately been patented in this country by Sir Charles Wheatstone. The Company has also purchased from the inventor, Mr. Thomas A. Edison, and from his business partner and assignee, Mr. George Harrington, the inventions know as the duplex and quadruplex.

They have recently taken charge of the Marine Line, New York to Sandy Hook, for marine news and the services connected therewith.

Arrangements are now being made for extending facilities by an additional route from New York City to St. Louis, Mo., from Chicago to Milwaukee, and from Rye Beach, N. H., to Portland, Me. Other and important extensions and connections to reach all the leading cities, both North and South, are under consideration, with the prospect of favorable results. The reduction of rates by the Company, which took effect on the 15th of February, resulted in an immediate increase of business throughout the territory affected by it, quite equal to expectations. The gross receipts for the first three months of the year were $180,738 42. The increase in March over February was over $7,000, and over January nearly $8,000. Further reductions would have been made before this but for the unusual severity of the weather, which has prevented to a great extent the work upon lines that would otherwise have been done, and the unavoidable delay in the manufacture of automatic machinery sufficient to equip all principal offices.

At Rye Beach, N. H., they connect, by contract, with the "Direct United States Cable Company," whose cable is in perfect working order from Rye Beach to Tor Bay, N. S. The shore end of the ocean cable is laid and buoyed, ready for connection with the deep-sea cable, which lacks less than a hundred miles east from the New Foundland coast to complete communication across the Atlantic.

CUSTOMER.—"Can you deliver this immediately?"

THE DOMESTIC TELEGRAPH CO.

EXECUTIVE OFFICES:

No. 52 BROADWAY, NEW YORK.

OFFICERS:

GEN. THOS. T. ECKERT, *President,*

J. B. EDSON, *Vice-President.*

D. G. FARWELL, *Treasurer and Secretary.*

THOS. A. EDISON, *Consulting Electrician.*

CHAS. BATCHALOR, *Electrician.*

Merchant relieved

and Customer satisfied.

MERCHANT.—"Yes, if you pay 10 cents for Telegraph boy."

Despatch.

Brought

THE

Subscribe

ONLY

Improved Telegraphic Circuit.

William E. Sawyer, Washington, D. C.—The main principle of this invention consists in a division of the transmitting battery current, and the placing of that battery at the receiving end of a line. The result of this application of electric force is not to free a line of tailings or the attenuation of impulses transmitted, which may exist to any degree in the line wire, but to prevent those tailings or attenuations of impulses from producing any effect upon the instrument. In order to produce or cut off action, or discoloration of chemical paper, in the receiving instrument, it is only necessary that the closing of the circuit at the transmitting end of a line shall set the current from the battery at the receiving end to dividing and a part of it flowing in the direction of the transmitting end. It is not necessary, therefore, that an impulse shall ever reach the transmitting end. It is not necessary that the current shall travel any distance upon the line wire, but that we reduce the potential of current acting upon the receiving instrument; and to reduce this potential, it is merely necessary that the current shall begin to flow by divisions toward the transmitting end.

RISE IN WESTERN UNION STOCK.

Tribune. July 31. 1875.

THE EXPLANATIONS CURRENT IN WALL-ST.—RUMORED PURCHASE OF THE ATLANTIC AND PACIFIC LINE—COMMENTS OF VICE-PRESIDENT GREEN—A REPORT OF THE SALE OF VANDERBILT'S SHARES.

A rumor was circulated at the Stock Exchange yesterday, a short time before its close, that the Western Union Telegraph Company had purchased the stock of the Atlantic and Pacific Telegraph Company. This had the effect of advancing the price of Western Union about 3 per cent, the closing quotations being 83¾. A reporter of THE TRIBUNE visited the office of the Company to learn, if possible, what truth there was in the rumor. President Orton was absent from the city; Vice-President Norvin Green stated that he did not think anything had been done yet in the way of a final agreement, although he did not doubt that there had been some discussion in an informal way upon the subject. "Ours is a business concern the same as any other similar corporation," he remarked, "and I have no hesitation in saying that it is our policy to make the promoters of other lines so sick of opposing us that they will never want to invest any money again in a rival telegraph line. At present we would not pay what Atlantic and Pacific stock is really worth to us just now, as there might be danger of inducing others to try the business. Whenever the managers of the Atlantic and Pacific Company are ready to admit that they cannot operate their lines any longer we stand ready to take their place. This is not necessarily monopoly, as we will do the business as cheaply as it can be done by any one else, but it is business."

At the office of the Atlantic and Pacific Company, Albert B. Chandler, the Secretary and acting manager during the President's absence, said that he did not know anything about the rumored sale of the Company. He thought it was nothing more than a stock jobbing sensation. He could not see the object of selling when the Company had no debts, and had enough money to pay all expenses for extending its lines for a year to come, while its income was as great as its operating expenses. Consequently he placed no confidence in the rumor.

It was also reported on the street yesterday that the rise in Western Union stock was due to the sale of Commodore Vanderbilt's interest in the line to other persons, among whom was Jay Gould and Wm. Orton. No confirmation of this rumor could be obtained during the afternoon and evening.

Jay Gould said last evening, when applied to for information in the matter, that he believed that Mr. Vanderbilt had not sold his Western Union stock, but is still among the largest stockholders. "No arrangement has been made," he added, "between the Western Union and Atlantic and Pacific Companies, although some of the large shareholders of the respective companies have held informal conferences to arrive at some basis for a harmonious working of the two systems that would be mutually advantageous. It is quite probable some such adjustment may be speedily made, especially if it be true that some of the largest holders have interests in both companies. The details of an equitable arrangement require further time to consummate."

THE MEETING OF THE DEMOCRATIC STATE

THE WESTERN UNION SPECULATION.

The *Tribune* semi-officially confirms the statement made in THE DAILY GRAPHIC two days ago that the Western Union Telegraph Company is about to pass under the control of Mr. Jay Gould. The result will be, of course, its consolidation with the Atlantic and Pacific Telegraph Company, and then the whole business and press of the country will be at the mercy of a giant monopoly, which monopoly will be controlled, for his own interests, by a man whose very name is a synonyme of all that is reckless and conscienceless in speculative enterprise. Our readers will bear witness that THE DAILY GRAPHIC, from the start, has insisted that the telegraph, being in its very nature a monopoly, should be under the control of the United States Government—the only power which represents the whole people. We have over and over again declared that it was unwise to allow this great agent of civilization to be subject to the caprices of speculators, and the property interests involved be the foot-ball and sport of Wall street. No man or set of men are good enough or wise enough to have at their mercy the press and business of the country. The telegraph transmits all the news; it tells the story of the markets of the world; it practically fixes the prices of every human product every business day in the year. One day of uncontrolled use of the cable telegrams coming to this country, and flashed over our great network of wires, would enrich a speculator beyond the "dreams of avarice." THE DAILY GRAPHIC has had no help from the press in warning the public against letting the telegraph lines become the property of speculators. Is this is the entertainment to which the leaders of the press invited their associates and the public when they argued for private as opposed to Government monopoly? Has Mr. Jay Gould such mental and moral superiority over all the rest of his countrymen that he should be permitted to wield a power like that which the telegraph will give to any one who controls it? We judge there will now be wholesale conversions, especially among editors, in regard to this very essential matter. Nothing educates so thoroughly as the logic of events.

THIRD EDITION.

THE CLOSE P. M.

JAY GOULD'S NEW SCHEMES.

THE PURPOSED PURCHASE OF THE TELEGRAPH PROPERTY OF THE ATLANTIC AND PACIFIC WILL RESULT IN THE SPREAD OF THE LATTER.

The bulls and bears are much amused over the course of the consolidation of the Atlantic and Pacific and Western Union Telegraph companies. Mr. Gould is the central figure in the party of the bears. The general tendency in the "street" yesterday morning in the opinion that the consolidation had not yet been effected, but that Gould was over the eyes of Jay Gould, who will either sell out his stock to Gould or buy him out. Gould is said to have "got left" on the "street," and now is down to the last resource of buying it in again and escaping "a new deal."

At Boston, Sherman & Co.'s banking house exhibited a notice that the transfer books of the Atlantic and Pacific would be closed until the last week in April, and that the stock would then be issued to the Western Union Company by parties who felt disposed to sell out. The Atlantic and Pacific Company has been organized but two years, fighting the Western Union desperately, not for the purpose of controlling itself, but after the hope of being bought up by the Western Union. The latter company has been trying to get control of the Atlantic and Pacific, the Pacific, and the Southern Atlantic and Mississippi Valley companies, and the Texas and Washington, and has succeeded in some of these cases, but in others it has failed. The struggle seems to be nearly over now, however, and it is believed that little yet, by careful estimate the Western Union Company has secured control of nearly twenty-three-fourths of the stock of the Atlantic and Pacific. It would be useless to lay up the Pacific Company, for the reason that it has not the great cities to which it can press that another company will secure. The Western Union and Atlantic Company is a case *de coupe*. The Atlantic and Pacific Company is the Western Union's only competitor, and it owns its own line to the north, and to that way a source of profit. But the Atlantic and Pacific Company controls the Western Union at every turn. In the matter of rates it is useless for a consolidation to be formed. In the unchanged hotels both the companies have been cutting rates, and it is reported to pay steadily for the past year, but not one company the hotels would be glad to have the outrageous rates of 1870. In 1866, the Belmont House in Albany, when the United States Telegraph Company was in control of the line, paid $10,000 a year for rent. In 1870 it was bought by the United States Company in, and threatened to increase the rent to $20,000 a year. Gould refused to do so for nothing, but the hotel boarded their operator, for in 1870 it is an outrageous paying concern. The Western Union Company has been trying to get control of the Atlantic and Pacific for a long time, and the consolidation would be regarded as a most favorable result. The Atlantic and Pacific Company has been trying to get control of the Atlantic and Pacific for a long time, and the consolidation would be regarded as a most favorable result. The Atlantic and Pacific Company has been trying to get control of the Atlantic and Pacific for a long time, and the consolidation would be regarded as a most favorable result.

ELECTRIC MOTION AND NEW MANAGEMENT.

QUIL—I venture to publish these remarks of mine, in the hope that they will be found to give a much better explanation of the theory of electric current on magnetized needles and magnets, than has hitherto been given in any of the books on that important subject. It is well known that a coiled needle or magnet, when placed directly under a revolving wire, horizontally, is moved forward along the conducting wire, will place itself almost at right angles to the wire, and that it is also well known that this is one of the principal actions of the electricity round the wire. I venture to think that it is this rapid rotary motion of the electric fluid, so that the progressive along the wire, was the principal cause of the motion of the needle or magnet. It is the rotary motion of the wire which causes the effort upon the needle or upon other conducting wire.

A good many of the experiments with the laboured needle, or galvanometer in its common form, are well known, but I have constructed one of another form with which some very curious results are obtained. I described it in almost the first number of the Electrician, under the signature of "Jesse Taylor."

A small piece of stiffish card (a piece of wine vessel label answers very well) (fig. 1), is laminated upon its centre upon the point A (fig. 2), and balanced upon it. Then a small piece of wire, at the end of the dotted line B (fig. 2), which cannot move round its own centre, but must move round the centre A. The magnet can be balanced by

Times of March.
The same journal also contains the following interesting figures:

The first eight months of the table are extremely low, and are only sold in small quantities, but at rates which would make the value of a pound as stated. It would be seen that the expression "worth its weight in gold," is by no means superfluous.

Value per ton.	Months.	Quantities.
£19 10s.	January	1 ton.
£19 10s.	February	1 ton.
£19 10s.	March	1 ton.
£19 10s.	April	1 ton.
£19 10s.	May	1 ton.
£19 10s.	June	1 ton.
£19 10s.	July	1 ton.
£19 10s.	August	1 ton.
£18 10s.	September	2 tons.
£18 10s.	October	2 tons.
£18 10s.	November	2 tons.
£18 10s.	December	2 tons.

(Continued from the N. Y. Tribune.)

Atlantic and Pacific Telegraph Company.

CENTRAL REPORT OF PRESIDENT BURNET.

The annual meeting of the Atlantic and Pacific Telegraph Company was held on April 5th at the office of the Company at No. 194 Broadway, Gen. Thomas T. Eckert was re-elected President.

There were constructed during the year 7,784 miles of wire. The lines and connections cover 14,035 miles of wire and 27,477 miles of wire, and brings them into direct communication with 1,265 offices. The number of offices in the line in the direct control of the Atlantic and Pacific Company at the close of the year was 5,937, and of wire 12,605.

The authorized capital stock of the Company is $10,000,000. The amount issued at the end of the year 1871 was $4,574,100, leaving a balance of 5,219 shares in the treasury.

The gross receipts of the Company for the year 1871 were $1,000,000. From Nov. 27 to Dec. 31 inclusive, were $150,201 93; the gross expenses were $99,131 97, leaving a net profit of $51,069 96. The principal source of income of the Company's funds, dent of from sale of its Treasury stock, were expended in the construction and purchase of lines. The Company had on hand at the close of 1871 two months' receipts sufficient for about two months use. The Company is free from debt of every kind.

Since the beginning of the year the Company has acquired working possession of the American Automatic Telegraph system, which is protected by thirty-six indisputable patents. The use of this system will add thousands of valuable messages every hour to automatic at the will of the operator. The Company has also purchased the exclusive right to the use of the Whitehouse Automatic system of Telegraph in the United States and the Island of Cuba. This system has lately been patented in this country by Sir Charles Whitehouse, the Company has purchased from the inventor, Mr. Thomas A. Edison, and from his business partner and manager, Mr. George Bartlett, the inventions known as the duplex and quadruplex.

The Company has offices in the cities of New York and Brooklyn, Jersey City, Hoboken, and the sections connected therewith.

Arrangements are now being made for extending facilities by an additional route from New York City to St. Louis, Mo., from Chicago to Milwaukee, and from Fire Branch, N. H., to Portland, Me. Offers have been made to the Company for the purchase of the lines of the Southern section, both North and South, are now under consideration, with the prospect favorable to the Company. The selection of agents for the Company, which took effect on the 15th of February, resulted in the appointment of seventeen Superintendents of the territory affected by it, quite equal to expectations. The gross receipts for the month of March were $100,000, and the net receipts for the same month were $50,000, and the net receipts for the year $27,000, and the net receipts for the year $27,000, and January nearly double. Twelve new offices have been added to the line before this but for the unusual severity of the weather, which has prevented in a great extent the work upon lines that would otherwise have been done, and the unavailable depot in the manufacture of automatic machinery sufficient to equip all the lines of the Company.

Fire Branch, N. H., they report, by contract, with the "Direct United States Cable Company," whose cables in per cent working order from Fire Beach to Tor Bay, N. S. The shore end of the ocean cable led inland nearly, for connection with all the deep-sea cable, which lurks less than a hundred miles off from the New Foundland coast to complete communication across the Atlantic.

Imported Telegraphic Circuit.

William R. Rogers, Washington, D. C.—The main principle of the invention consists in a division of the transmitting battery circuit into two parts, and the placing of that battery at the receiving end of a line, and by the application of electric force to not to force it upon the line, but the alternation of impulses between those battery cells to any degree in the line wire, but without any effect upon the or alternation of impulses from a set of active or disobedition instrument. In order to prevent leakage, it is only necessary of obviating the current at the transmitting end of a line, and to set the relay from the battery at the receiving end to the ground, and to put a spring in it acting in the direction of the transmitting current. It is not necessary, however, that an impulse shall ever leave the transmitting end. It is not necessary that a current shall travel any distance upon the line wire, but it is sufficient that the current acting upon the receiving instrument; and in order to reduce this potential, it is merely necessary that the current shall begin to flow by distance toward the transmitting end.

RISE IN WESTERN UNION STOCK.
April 14, 1872.

THE EXTRAORDINARY CONDUCT IN WALL STREET—SOLID PURCHASE OF THE ATLANTIC AND PACIFIC LINE—CONTROL OF THE TELEGRAPH INTERESTS—THE MOTIVE OF THE SALE OF VANDERBILT'S SHARES, ETC., ETC.

A Tribune Circular to the Stock Exchange yesterday, a short time before its close, that the Western Union Telegraph Company had purchased the stock of the Atlantic and Pacific Telegraph Company. This had the effect of advancing the price of Western Union about 2 per cent, the closing quotation being 83¾. A portion of The Tribune visited the office of the Company to learn, if possible, what truth there was in the report. The following statement was made to a Tribune reporter: First-class men admit that it did not think anything had been done yet in the way of a final agreement, although he did not doubt that there had been some discussion as to what it may upon the subject. "There is a business concern the same as any other similar corporation." he remarked, "and I have no hesitation in saying that it is our policy to make the possession of other lines as cheap as possible to that they will never want to invest any money again in the construction of lines. We have no objection to what Atlantic and Pacific stock we can get, and we have now, as these might be secure of interest others to by the business. Whenever the managers of the Western and Pacific Company are ready to admit that they can make money by selling out their stock, we are ready to buy their lines. This is not necessarily positive, and we do the business as cheaply as it can be done by any one who has the money to buy."

At the office of the Atlantic and Pacific, Mr. Albert B. Chandler, the Secretary, was seen by a reporter of The Tribune. He was asked if there was any truth in anything about the formal sale of the line. He thought there was nothing, more than the Company had been for sale for some time, and the Company had been for sale for some time, and had simply ordered to pay all expenses for advertising the sale. He knew of no negotiations now pending, and of no speaking witness. Consequently he could not authenticate the report.

The Tribune learned on the street yesterday that the Western Union stock was the result of a desire to make Vanderbilt's interest in the line to other persons, and that Mr. Vanderbilt had sold out his stock. The friends of the former could be obtained during the afternoon had evening.

Mr. Jay Gould, however, when applied to for information on the subject, declared that he "knew nothing" and had sold his Western Union stock, but to sell Atlantic and Pacific. He said that the Western Union had been in control of the Atlantic and Pacific, Southern Union and Atlantic and Pacific Company for some time, and that the Western Union Company of the consolidation of the Atlantic and Pacific Company in order to secure a harmonious working of the lines. He said that the Western Union Company is now probably more than two-thirds of the stock, and that it is generally made, especially if it be true that some of the Vanderbilt stock has been sold to the Western Union. The profits of such a consolidation would be very large to the combination.

THE MEETING OF THE DEMOCRATIC STATE

THE WESTERN UNION SPECULATION.

The Tribune pseudo-officially confirms the statement made by The Daily Graphic a few days ago that the Western Union Telegraph Company is about to pass under the control of the Atlantic and Pacific. The result will be, of course, its consolidation with the Atlantic and Pacific Company, and then the whole business and press of the country will be at the mercy of a single corporation. The monopoly will be complete, for in one respect, at least, it will be more perfect than that of the Standard Oil Company—it will have no competitor. The Atlantic and Pacific Company is a mere speculative enterprise. Our readers will bear witness that The Daily Graphic, from the start, has insisted that the telegraph, being in its very nature a monopoly, should be under the control of the United States Government—the only power which represents the whole people. We have over and over again declared that it was unjust to allow any private corporation to control the property of the people. Precisely as the Post Office Department has the form-hell and

CHARGES.

Ten Cents for twenty minutes, which is the smallest charge made; and at the rate of

Thirty Cents per hour for any longer time than twenty minutes.

Two Dollars for responding to Fire Alarm Signal, and

Thirty Cents per hour for any time employed.

Special rates on application when boys are wanted by the day or half day.

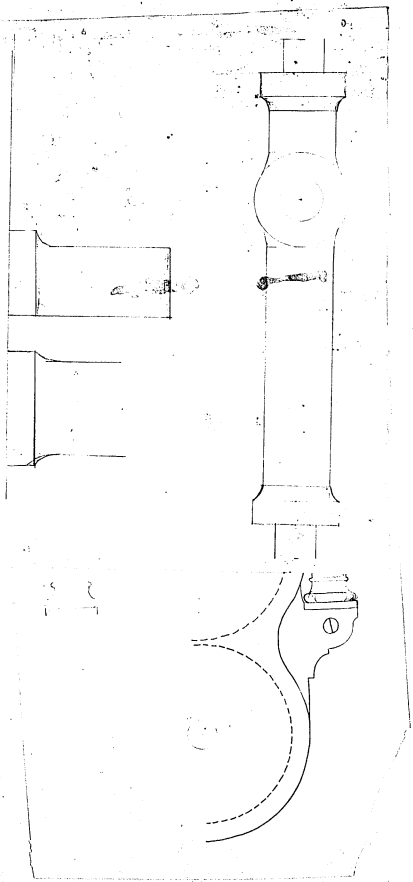
FORM OF SUBSCRIPTION.

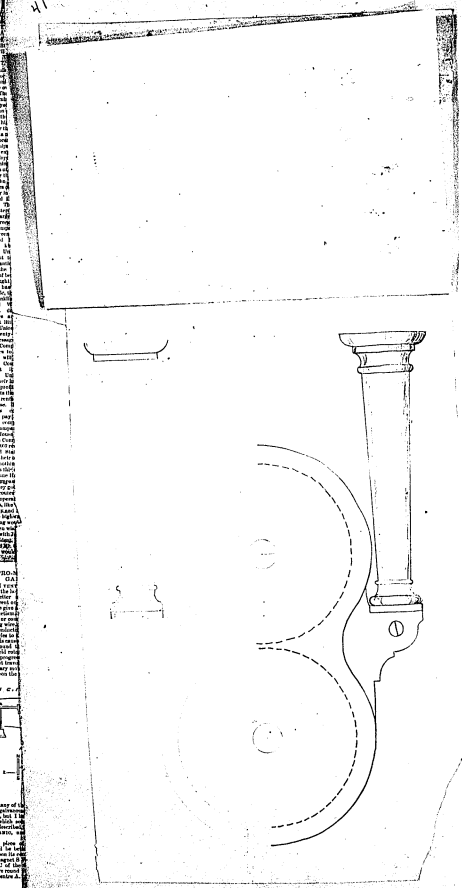
The undersigned for himself requests "The Domestic Telegraph Co" to place in his premises, one of their signal instruments, in telegraphic communication with the Company's office, hereby agreeing to pay thereof their regular rate of rental, and the usual charges when the messenger or other service is employed.

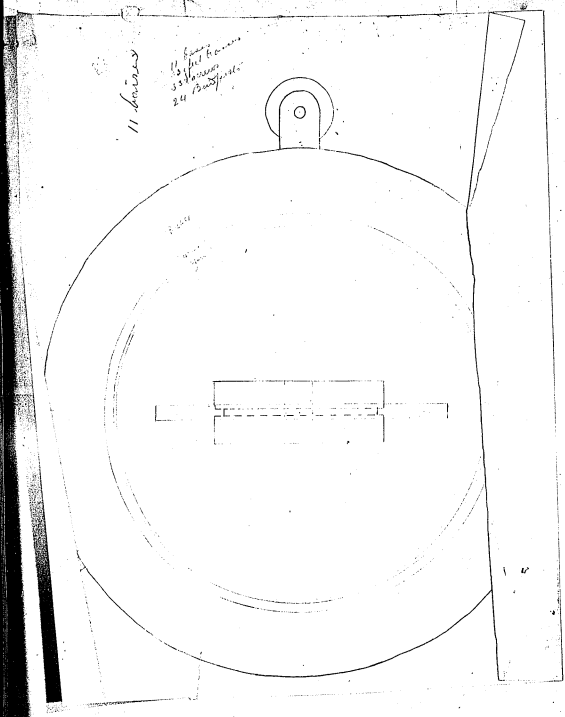
It is hereby mutually understood and agreed that this Company will in no case be liable beyond the sum of Ten Dollars for any loss or damage that may occur during, or in consequence of, the employment of any of its Messengers

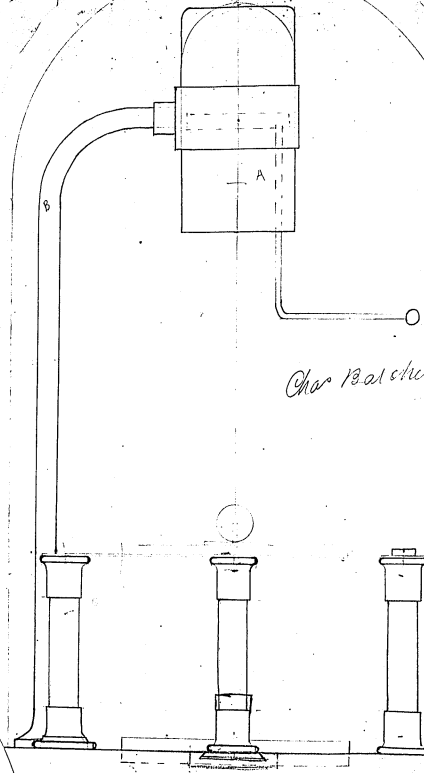
Date, Name,

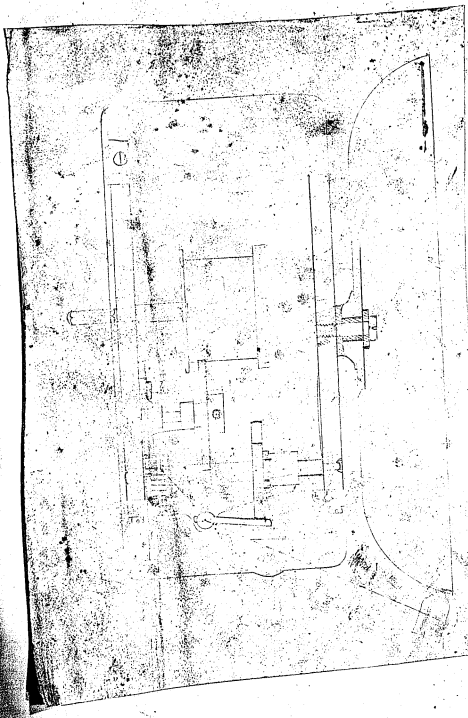
Premises,








A
B
B
Chas. Balch & Sons



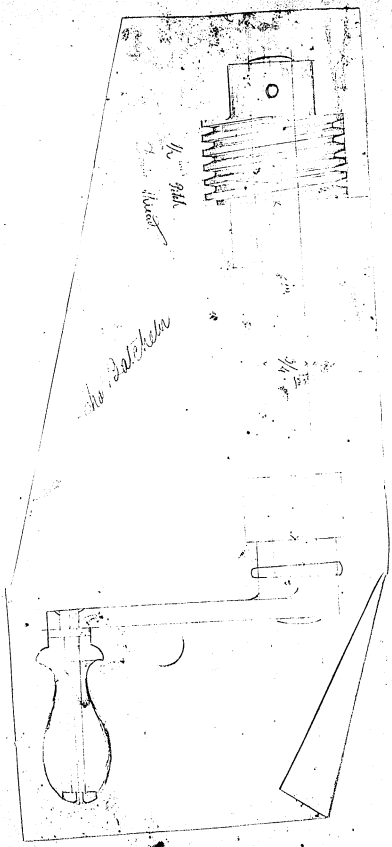


Fig 11

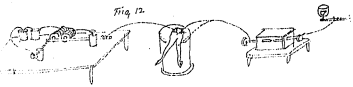


Fig 12

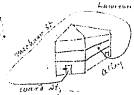


Fig 13

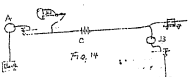
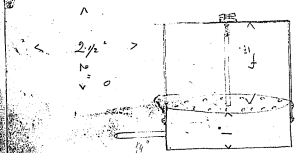


Fig 14

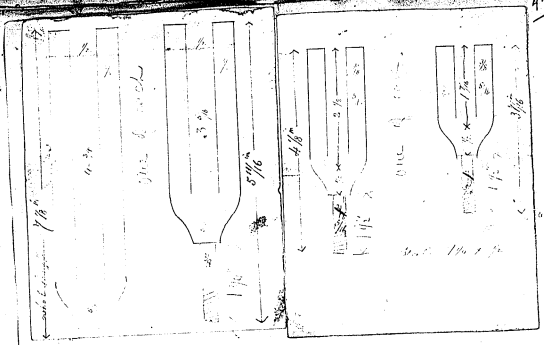
Fig 15

1

20 Feb



2

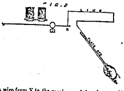

1 7/8"
5 1/16"
4 1/8"
3/16"

ETHERIC FORCE.

[10177.]—DURING the night of the 22nd of November, as Mr. Thos. A. Edison, assisted by myself, was experimenting in his laboratory, we discovered what we think will eventually prove to be a new *force*. It occurred in the following manner: We had on the table an electro-magnetic vibrator, constructed as in Fig. 1. A is a rod of Stubbs' steel 10in. long; B is an ordinary electro-magnet, of 14 Ohms resistance; C is eight cells of Bunsen battery, and D the contact spring. Whilst working with this, we noticed sparks passing between the cores of the magnet and the steel bar A, which did not touch it in any way. Such sparks we had often noticed from relay magnets, the magnets of quotation printers when filings had got in between the cores and armatures, and more especially in electrical engines when running at high speeds. We had already followed up this phenomenon some two years ago for a considerable time, when Mr. Edison reluctantly came to the conclusion that it was caused by induction. The very strong spark passing in this instance caused us to think that there must be something more than induction, and we determined to investigate it further. We found that we could draw sparks from the point X, at the end of bar A, by holding a piece of wire to it. We connected a wire to the point X, and carried it to a stove 20ft. distant, and, on scratching the stove with the end of the wire, we got brilliant sparks. One of the most curious properties we noticed was that you could turn the end of the wire round, and touch any part of itself, and get a spark. We now connected

FIG. 1

FIG. 2



a wire from X to the gaspipe, and found we could draw sparks from the gaspipe in any part of the building by simply touching it with a file or wire. This seems incredible, but any of your readers can try it, and they will find it correct. We now placed a large block of iron about 2in. from the rod, and drew sparks from it, although it had no other connection with X than the wood they were both on. We also connected the rod at X with a telegraph line 75 miles long, both ends of which, well insulated from each other, and the building, come into the laboratory, and got sparks every time the continuity of the line was broken; but observe that there was no ground to this, it being connected as in Fig. 2.

We now found that it was not necessary to have a vibrator to get the spark, as we could get it from a simple circuit with a Morse key and an electro-magnet in it—a piece of iron being placed across the poles of the magnet, from which the wire was taken, as shown in Fig. 3: A is the battery, B the electro-magnet, C a Morse key, and D the piece of iron. We also found that the spark was most brilliant when caused between two graphite points; so we made a box containing two adjustable graphite points, with a hole in the top to look in. After experimenting for some time we found that cadmium (a metal kindred to zinc in nature), of all metals tried was the best to place on top of the magnet, and the one from which we drew the best sparks. At this point we insulated the key, battery, magnet, wire, and box, so completely by glass as to prevent any possibility of electrical induction currents; then placing the cadmium bar across the magnet, and connecting a wire from it to the gaspipe, and also one of the graphite pencils, brilliant sparks were got between the two pencils, although

FIG. 3

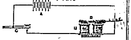


FIG. 4

it was directly grounded by the gas-pipe before it reached the box. A delicate gold-leaf electroscope was undisturbed by this new manifestation, and in a mirror galvanometer, put in line and connected to the earth, the spot of light could not be induced to deflect a single degree when graphite points would give brilliant sparks when connected as in Fig. 4.

We placed the cadmium bar inside a spool of wire, instead of on top of a magnet, and found that we could get as good a spark as when using a magnet: hence it is not necessary to have a magnet in the circuit, it being produced directly from electricity. We have made many tests with mirror galvanometers, electroscopes, chemical paper, and Leyden jars worked by accumulation, &c., to endeavour to prove that it is electricity, but without success. These experiments seem to prove conclusively that either electricity may manifest itself in an entirely new phase, or that under certain conditions it gives birth to a new and distinct force, governed by distinct laws. Whatever it may be, we deduce the following results from our present experiments: That it is non-polar, radiating in straight lines, like heat, that it is capable of transmission to indefinite distances through uninsulated wires, that it is not affected by the ordinary non-conductors of electricity, such as glass, &c., and that it is retroactive, the spark being, as I said before, when turned round so as to touch itself. Mr. Edison has named it "etheric force."

Batchelor.

Newark, N.J., U.S.A.

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[For the Scientific American.]

THE NATURE OF THE NEWLY DISCOVERED FORCE.

BY GEORGE M. BEARD, M. D.

In my letters to the *Tribune* and in my lecture before the Polytechnic Club, I advanced a theory of the force recently discovered by Mr. Edison, that might perhaps ally it to electricity, though not to any known form, and account for its non-polarity and other phenomena exhibited by it. This theory I suggested and used merely as a temporary working hypothesis. At the present time, the weight of evidence in my mind is in favor of the theory that this is a radiant force, somewhere between light and heat on the one hand and magnetism and electricity on the other, with some of the features of all these forces. Experiments of the following kind are of themselves powerful arguments in favor of this theory:

When the wire conducting the force from the battery to the dark box is divided in the air, and the ends are separated even a sixteenth of an inch, no spark appears in the dark box. Lay these ends of the wire on a semi-conductor, as wood, and the force will pass when they are separated a moderate distance. Place small pieces of tinfoil about these ends as they are suspended in the air, and the force now passes one inch or perhaps several inches through the air. Place pieces of tinfoil of larger surface about these ends, and separate them a wider distance, and the force will yet pass. Make the surfaces of tinfoil larger still, until they are a foot square or more, and the force will travel several feet through the air. Prepare three large pieces of tinfoil, place one piece on each end of the divided wire suspended as before, and the other piece about equidistant between them; and still the spark may be seen (though faintly and irregularly) in the dark box. The force must jump from the piece of tinfoil at one end of the wire to the middle piece, which acts as a kind of resting place, and thence to the piece at the other end of the wire. The spark has been obtained (though with difficulty, and only after very nice adjustment of the pencil points in the dark box) after having passed through four pieces of tinfoil, the distance from the first piece to the last being eight feet. The highest tension statical electricity, as generated by Holtz' machine, could not do this; and electricity prefers to pass by points. Through experiments of this kind we have learnt one important law of this force, namely, that it prefers to pass through surfaces; and the larger the surface, the better it passes through any bad conductor, at least within certain limits.

Phenomena of the kind here described suggest magnetism more than induction or dynamical electricity; but this force does not respond to the test of magnetism, the power to attract iron; and moreover it exhibits phenomena that do not belong to magnetism. It is attracted by iron and other metals, as conductors, but it does not itself attract iron.

The points which favor the radiant theory of this force may be thus recapitulated:

1. It does not respond to any of the physical tests of electricity, except the spark.

2. It produces no perceptible or demonstrable physiological effects, like electricity.

3. It is not resisted by non-conductors as air, water, glass, rubber, and paraffin, to the same degree as electricity.

4. It gives no evidence, in any of its phenomena, of polarity.

5. It passes through non-conductors, as air, rubber, glass, etc., most readily by large surfaces at the terminals, while electricity prefers to pass by points.

6. It diminishes in strength with the distance from the battery, possibly in some definite ratio, although that is not yet demonstrated.

Any form of electricity giving a spark like the spark of this force would respond to some of the physical tests of electricity, would produce readily perceptible physiological effects, would be powerfully resisted by the air, and would in all its phenomena suggest polarity, even if rapidly reversed.

Again, the four facts regarded by me as favoring the theory that this force is allied to electricity, are, when severely analyzed, not so convincing as they might at first appear. The spark of this force resembles the spark of dynamical electricity; but so also does the spark produced by combustion. The velocity of this force is great, but so also is that of light. This force is best conducted by metals; but so also is heat. This force is resisted somewhat by non-conductors, but so also is heat, and both to a less degree than electricity.

If it be, as I have suggested, a kind of electricity which, after the manner of the shuttle, returns to its source by rapid forward and backward movements, it would yet be electricity under very different conditions from those under which we are wont to consider it, and would be practically a new force. The more I experiment in this department, and the more closely I reflect on the results of experiments, the farther I seem to be driven from the electrical toward the radiant theory of this force; and there would appear to be no ready escape from the conclusion that we have here something radically different from what has before been observed by Science. The relation of this force to the other forces may be thus represented:

Light, Heat . . . New Force . . . . . . Magnetism, Electricity.

The above would represent Mr. Edison's theory of a radiant force, nearer to light and heat than to magnetism or electricity.

The theory I have suggested would bring the force nearer to magnetism and electricity than to light or heat, as follows:

Light, Heat . . . . . . New Force . . . Magnetism, Electricity.

The discovery that broad surfaces at the terminals are necessary to conduct this force through non-conducting solid bodies, as glass, rubber, paraffin, etc., was made but a few nights ago. That the force passed through air when large surfaces were at the terminals had been proved previously by Mr. Edison's experiments and by my own. A large surface of tinfoil (6x6 or 12x12 inches) was connected with one end of the divided wire, and laid on a table. Over this were placed broad pieces of hard rubber, glass, or paraffin, and on the top of these was placed a similar piece of tinfoil connected with the other end of the divided wire, through which the force was to be conducted to the dark box. In this way, it was proved that the force could pass through 2½ inches of dry wood, 2 plates of glass, each ⅛ of an inch in thickness, ½ of an inch of hard rubber, ¼ of an inch of solid paraffin, and 5 layers of paraffin paper. When the surfaces at the ends of the wire were reduced in size, or when the tinfoil at one end was removed, the force passed less easily. When the tinfoil at both ends was removed, and only a few inches of fine wire constituted the surface, the force passed, but through thinner resistance. When only the terminals of the wires were applied to the resisting body, the force would not pass at all, or but a very short distance. The force passed through 8 inches of water, and was apparently but little diminished even when the surface at the terminals was but an inch of fine wire.

Useful Recipes for the Shop, the Household, and the Farm.

A new compound for polishing and cleaning metals is composed of 1 oz. carbonate of ammonia dissolved in 4 ozs. water; with this is mixed 16 ozs. Paris white. A moistened sponge is dipped in the powder, and rubbed lightly over the surface of the metal, after which the powder is dusted off, leaving a fine brilliant luster.

A new alloy for bell metal is proposed, which does not tarnish, is less liable to crack, gives a better sound, and is much lighter in weight than the alloy usually employed for the purpose. It is prepared as follows: Nickel 1 lb. and copper 6 lbs. are melted and cooled. Add zinc 2 lbs., aluminum ½ oz. Melt and cool. Melt again, and finally add ½ oz. quicksilver and 6 lbs. melted copper.

A very beautiful application of electro-metallurgy is to apply a coat of silver by electro deposition on natural leaves and flowers. By this means very delicate ornaments are produced, since the precise form and texture of the natural leaf are produced under the thin silver film.

Lemons can be preserved by varnishing them with a solution of shellac in alcohol. The skin of shellac formed is easily removed by rubbing the fruit in the hands.

J. Q. R. B. says: Varnish made with alcohol will get dull and spongy by the evaporation of the alcohol, which leaves water in the varnish, as all commercial alcohol contains water. Take thin sheet gelatin, cut it in strips, and put it in the varnish; it will absorb most of the water, and the varnish can be used clear and bright till the last drop. The gelatin will get quite soft; it can then be taken and dried, and used again. "I have used this plan for the last two years in photographic varnish, and have never had to throw away one drop."

There is no simpler remedy for preventing cider growing sour than mustard seed. After the cider has fermented and reached the desired palatable condition, put 1 pint mustard seed to a barrel of cider, and bung tight.

April

not sending

(No. 1 a. Revised Nov. 1884.)

No.

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(The public in New York is recommended to hand in Messages at this Office, whence they will be transmitted direct to their destinations by independent wires.)

FORM FOR MESSAGE, "VIA DIRECT CABLE" for Great Britain and Ireland, the Continent of Europe, Turkey, Egypt, Persia, India, Penang, Singapore, Cochin China, China, Japan, Java, Australia, New Zealand, and the East generally.

Prefix..... Code Time..... No. of Message..... No. of Words..... Rec'd ..... m ..... 187 Finished..... m Sent to 187

Route VIA..... By me..... Clerk. Counter Clerk..... Special Instructions.....

CHARGES—Message $..... Repeating..... Reply..... To be paid out..... Total $.....

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TO..... Address.....

To prevent Mistakes attention is called to the importance of legible writing.

"Via Direct Cable."

(You are requested before signing to read the Conditions on the back hereof.)

Signature,..... *Address*,.....

The name of the place at which the Message originates is transmitted free of charge.

Messages for the DIRECT CABLE are also received at the undermentioned offices of the ATLANTIC & PACIFIC TELEGRAPH COMPANY.
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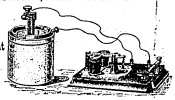

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THE above cut represents J. F. Gilliland & Co.'s Telegraph Instrument, which is the most complete both in parts and style of finish that has ever been offered to the public. This Instrument is substantially made, finely finished, and put up in a neat box, with battery, and is guaranteed as represented.

The sounder is made with two spools, and has an adjustment for the lever, so that it can be worked with either a strong or weak battery, an attachment which you will not find on other cheap instruments. The Key is the same style as that used by the *Western Union Company*, but of a miniature size, with good platina points which is a great deal easier to write with than the common spring brass key that is used on other cheap instruments.

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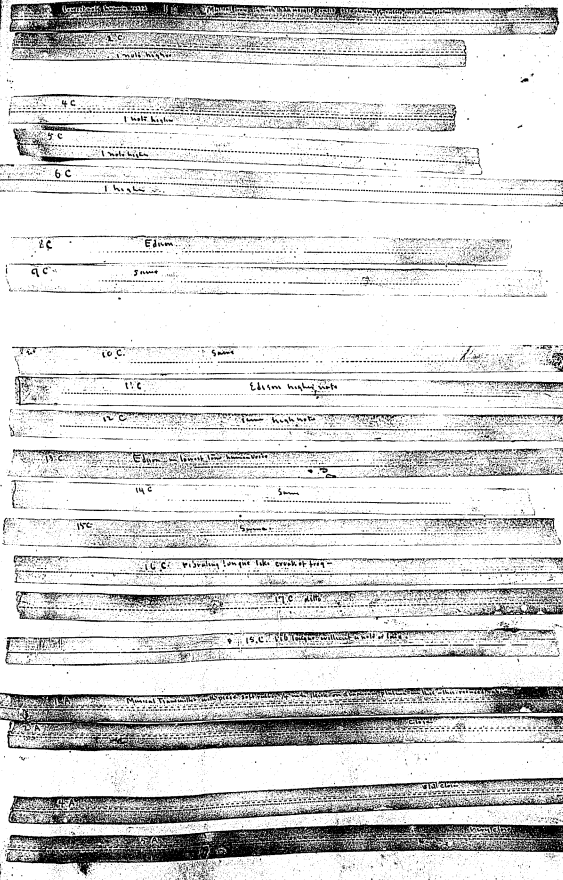
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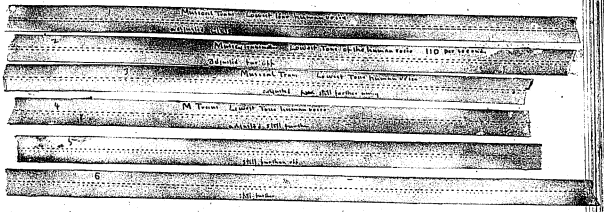

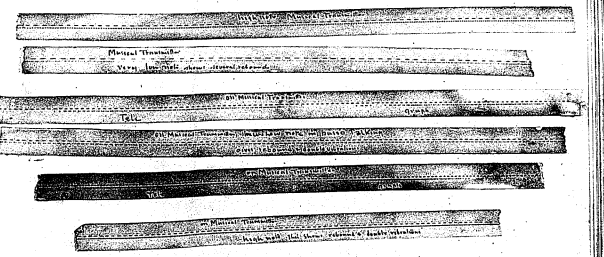

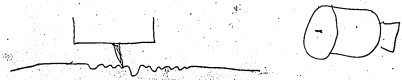

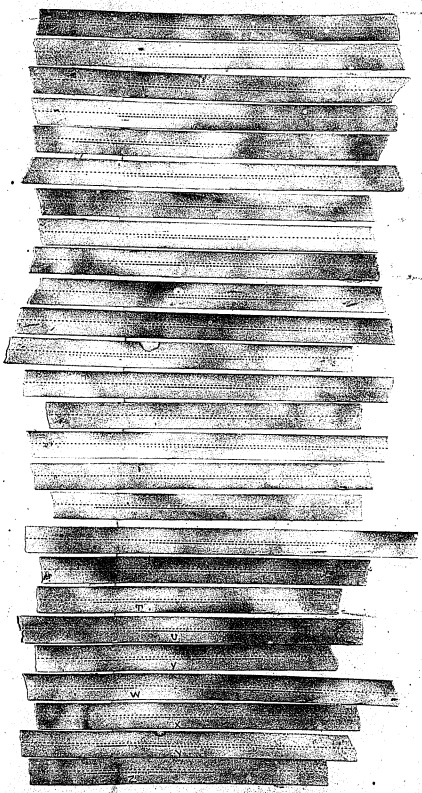
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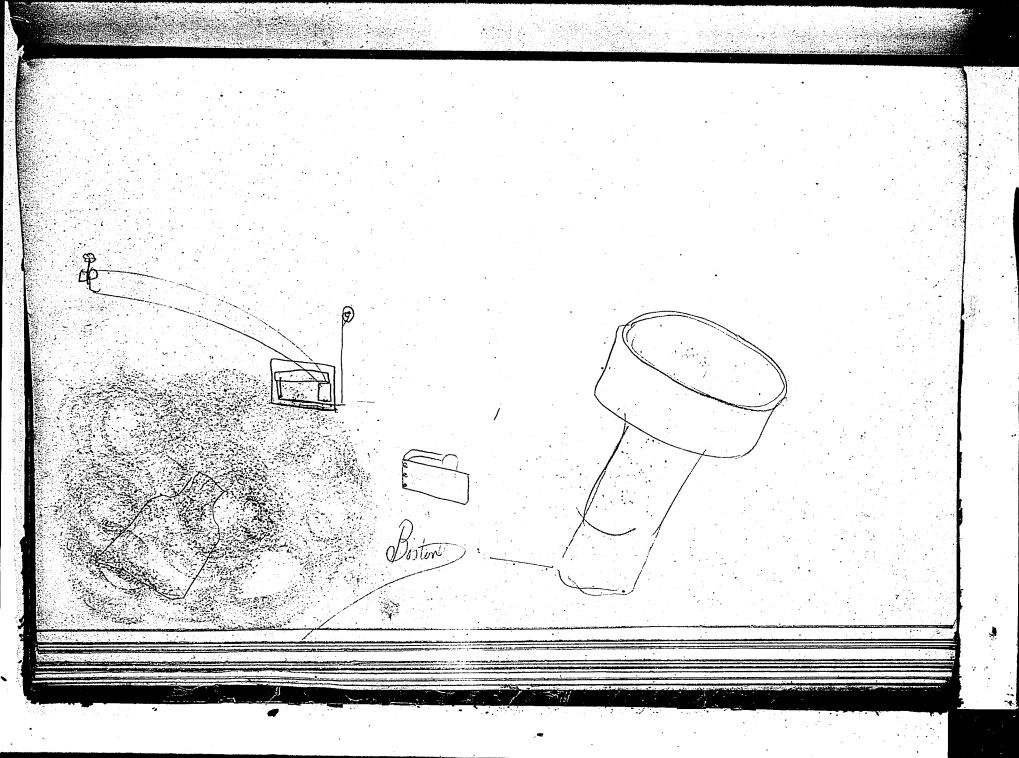
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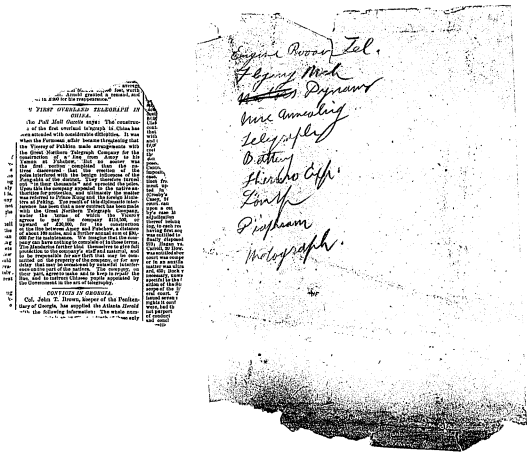

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